2 ALTERNATIVES

This chapter describes the network and alignment alternatives and station location options considered for the proposed California HST system in the Bay Area to Central Valley study region. This Program EIR/EIS is a program-level environmental document, and the analyses herein are intended to define broad differences between alternatives. The level of detail for alternatives is conceptual or general rather than site-specific (40 CFR § 1508.28; 14 CCR § 15385). Subsequent project-level environmental documents and analyses would assess site-specific engineering and environmental impacts for alternatives selected in this Program EIR/EIS.

The alternatives discussed in this chapter were developed considering previous studies defining the project and information gathered in the scoping process. All alternatives that have been considered in this Program EIR/EIS process are described in this chapter, including those rejected from further consideration and the basis for their rejection. The No Project/No Action (No Project), HST Network, and HST Alignment Alternatives are described in detail in this chapter, and their development is summarized.

Several terms specific to the project are defined below. See Chapter 15, “Glossary,” for definitions of technical and other terms.

- **Study Region:** Bay Area to Central Valley region encompassing all six study corridors.
- **No Project Alternative:** Represents the region’s (and state’s) transportation system (highway, air, and conventional rail) as it is today and with implementation of programs or projects that are in regional transportation plans and have identified funds for implementation by 2030.
- **Study Corridors:** Six linear geographic belts or bands being considered for the HST system that connect different parts of the study region. They are distinct in terms of land use, terrain, and construction configuration (mix of at-grade, aerial structure, and tunnel sections) and generally follow the route of a transportation facility.
- **HST Network Alternatives:** Represent different ways to implement the HST system in the study region with combinations of HST Alignment Alternatives and station location options. These HST Network Alternatives are identified in Chapter 2 and compared in Chapter 7.
- **HST Alignment Alternatives:** General location for HST tracks, structures, and systems for the HST system between logical points within study corridors; they are generally configured along or adjacent to existing rail transportation facilities. These HST Alignment Alternatives are described in Chapter 2, analyzed in Chapter 3, and compared and used to create HST Networks in Chapter 7.
- **HST Alignment Segment:** A portion of an alignment (often defined to distinguish subalternatives) that can be combined with other segments to form an alignment.
- **Station Location Options:** General locations that represent the most likely HST stations based on current knowledge, consistent with the objective to serve the state’s major population centers.

2.1 Summary of Alternatives

This section provides a brief synopsis of the alternatives analyzed by the Authority and the FRA in this Program EIR/EIS.

2.1.1 No Project Alternative

The No Project Alternative represents the state's transportation system (highway, air, and conventional rail) as it is today and would be after implementation of programs or projects that are currently in regional transportation plans and have identified funds for implementation by 2030.

2.1.2 High-Speed Train Network and Alignment Alternatives

HST Network Alternatives represent different ways to implement the HST system in the study region to better understand the implications of selecting certain HST Alignment Alternatives and station location options. The HST system would continue outside the study region to the major metropolitan areas in the state, as described in the statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005). The Authority and the FRA developed a range of potential alignment alternatives and station location options in the study region (Figure 1.1-1). Informed by previous studies and the scoping process, the Authority and the FRA evaluated the potential HST Alignment Alternatives and identified those that best meet the project purpose and need, are reasonable, and are feasible.

The proposed HST system selected in the statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005) and further analyzed in this Program EIR/EIS is electrified steel-wheel-on-steel-rail dedicated service, with a maximum speed of 220 mph (350 kph). A fully grade-separated, access-controlled right-of-way would be constructed, except where the system would be able to share tracks at lower speeds with other compatible passenger rail services. Shared-track operations would use existing rail infrastructure in areas where construction of new separate HST facilities would not be feasible. Although shared service would reduce the flexibility and capacity of HST service because of the need to coordinate schedules, it would also result in fewer environmental impacts and a lower construction cost.

2.2 Chapter Organization

The remainder of this chapter is organized into the following three sections:

- Section 2.3 describes the development of the proposed HST system.
- Section 2.4 describes the No Project Alternative.
- Section 2.5 describes the HST Alternatives considered in this Program EIR/EIS, including the HST Network Alternatives, the HST Alignment Alternatives, station location options, and maintenance facility location options. Alignment alternatives and station location options considered and rejected are also described.

2.3 Development of Alternatives

This section describes the process used to evaluate conceptual alternatives presented in previous feasibility studies and identified through the scoping process for the HST system, leading to the set of HST Network Alternatives and HST Alignment Alternatives that are analyzed in this Program EIR/EIS. Key criteria used to distinguish among alternatives are described in Chapter 1, "Purpose and Need and Objectives," and include connectivity, right-of-way constraints and compatibility, ridership potential, constructability, and environmental impacts.

2.3.1 Background

Since 1994, three planning and feasibility studies and a statewide program EIR/EIS have been completed under the direction of the California Department of Transportation (Caltrans), the former California Intercity High Speed Rail Commission (Commission), and the Authority. The specific scopes of work of the feasibility studies differed, but they all focused on identifying potential HST technologies and corridors and broadly evaluated their feasibility. The three feasibility studies culminated in the Authority's final business plan (Business Plan) for an economically viable HST system that would serve major metropolitan areas of California (California High-Speed Rail Authority 2000). Also, in 1997, the FRA published *High-Speed Ground Transportation for America,* a national study examining the commercial feasibility of new high-speed ground transportation systems (Federal Railroad Administration 1997). This commercial feasibility study uniformly applied economic principles to weigh likely investment needs, operating performance, and social benefits of different types of train services in regional travel markets. The Authority followed these principles and in the Business Plan defined a practical approach to construct, operate, and finance an HST system that would yield solid financial returns to the state and provide potentially dramatic transportation benefits to all Californians. A preferred alignment and potential station locations were selected for most of the proposed statewide HST system as part of the final statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005). However, between the San Francisco Bay Area and Central Valley, a broad corridor was identified for further evaluation.

These environmental, planning, and feasibility studies considered environmental constraints and potential impacts, with the objective of avoiding or minimizing impacts on sensitive resources where possible. Most of the study corridors considered follow existing highways or railroad lines, particularly in urban areas, to avoid or minimize environmental impacts. Many of the alignments for corridor and station locations emerged from regional and local agency input. Potential station locations were identified for operational and ridership forecasting purposes, and alternative sites were considered as part of the corridor evaluation. However, specific station sites were not selected. The studies were done consecutively, such that each subsequent study benefited from and built on previous work to further refine and develop potential station location options. The scope, timing, and products of each of the three studies, the Business Plan, and the statewide program EIR/EIS are described below. The relationship between the feasibility studies is illustrated in Figure 2.3-1.

A. LOS ANGELES TO BAKERSFIELD PRELIMINARY ENGINEERING FEASIBILITY STUDY (1994)

In 1994, Caltrans completed a study that analyzed the feasibility of constructing an HST system across the Tehachapi Mountains in southern California. The Tehachapi Mountains is one of the largest physical constraints (if not the largest physical constraint) to the development of a statewide HST network. The study produced an evaluation of the various HST technologies, as well as engineering drawings, cost estimates, and preliminary environmental analysis for potential alignments traversing the Tehachapi Mountains. The study also produced drawings and cost estimates for potential stations, developed operating plans, and estimated travel times for this segment of a statewide system. The study is documented in the *Los Angeles–Bakersfield Preliminary Engineering Feasibility Study Final Report* (California Department of Transportation 1994).

Alignments were studied using then-current aerial photographs and maps at a scale of 1 inch (in) equals 200 feet (ft). The feasibility study included preliminary engineering analysis of several key technical issues (e.g., structures, tunneling, and unit capital costs). The corridors studied traversed a variety of terrain (e.g., urban development, mountains, and valley floor). The study provided an important foundation for the subsequent statewide corridor evaluation studies.

The feasibility study considered a broad range of alternative alignments and then focused on the most viable routes. Two main corridors between Los Angeles and Bakersfield were considered feasible in terms of cost, travel time, potential ridership, and environmental constraints: Interstate 5 (I-5)/Grapevine and Palmdale–Mojave (Antelope Valley).

B. CORRIDOR EVALUATION AND ENVIRONMENTAL CONSTRAINTS ANALYSIS (1996)

The Commission conducted a three-phase study, which was completed in 1996. The first phase defined the most promising corridor alignments for linking the San Francisco Bay Area and Los Angeles (Figure 2.3-2). The second phase examined these alternative corridors between Los Angeles and the Bay Area in more detail. The third phase examined potential HST system extensions to Sacramento, San Bernardino/Riverside, Orange County, and San Diego.

The study identified potential station locations; estimated travel times; developed construction, operation, and maintenance cost estimates; analyzed environmental constraints and possible mitigation measures; and, in an iterative process with a ridership study prepared for the Commission, developed a conceptual operating plan. The corridors considered in all phases of this study are described in the *High-Speed Rail Corridor Evaluation and Environmental Constraints Analysis Final Report* (California Intercity High Speed Rail Commission 1996).

This analysis was completed concurrently with studies addressing four other aspects of a proposed high-speed rail system: ridership and revenue projections, institutional and financial options, economic impacts and benefit/cost analysis, and public participation. The corridors recommended for study by the 1996 analysis are shown in Figure 2.3-3.

C. HIGH-SPEED RAIL CORRIDOR EVALUATION (1999)

In September 1998, the Authority initiated a study to evaluate the viability of various corridors throughout the state for a statewide HST system. The Authority was legislatively mandated to move forward in a manner that was consistent with and continued the work of the Commission. Potential corridors were evaluated for capital, operating, and maintenance costs; travel times; and engineering, operational, and environmental constraints. This study is documented in the *California High-Speed Rail Corridor Evaluation Final Report* (California High-Speed Rail Authority 1999).

This study provided the Authority with a basis for recommending a potentially feasible network of HST corridors for further study. Although previous studies had been limited in the number of alternatives that could be analyzed in certain areas of the state, other potential corridors and new issues were identified in the 1999 study as regional and local agencies provided their input on the recommendations of the previous studies.

D. BUSINESS PLAN

The Business Plan presents a reasoned approach for constructing, operating, and financing an efficient and economically viable statewide HST system capable of speeds up to 220 mph (350 kph) that would be electrically powered and fully grade-separated and link California's major metropolitan areas. The Business Plan was based on the analysis from the *High-Speed Rail Corridor Evaluation* (1999), as well as ridership and revenue, cost-benefit, financial planning, and system integration studies.

The Business Plan concluded that "a high-speed train system is a smart investment in the state's future mobility. It will yield solid financial returns to the state and provide potentially dramatic transportation benefits to all Californians. It is a system that can be operated without public subsidy. The public's investment should be limited to that which is necessary to ensure the construction of the basic system."

The analysis and objectives summarized in the Business Plan found that an HST system would be able to:

- Return twice as much financial benefit to the state's citizens as it costs.

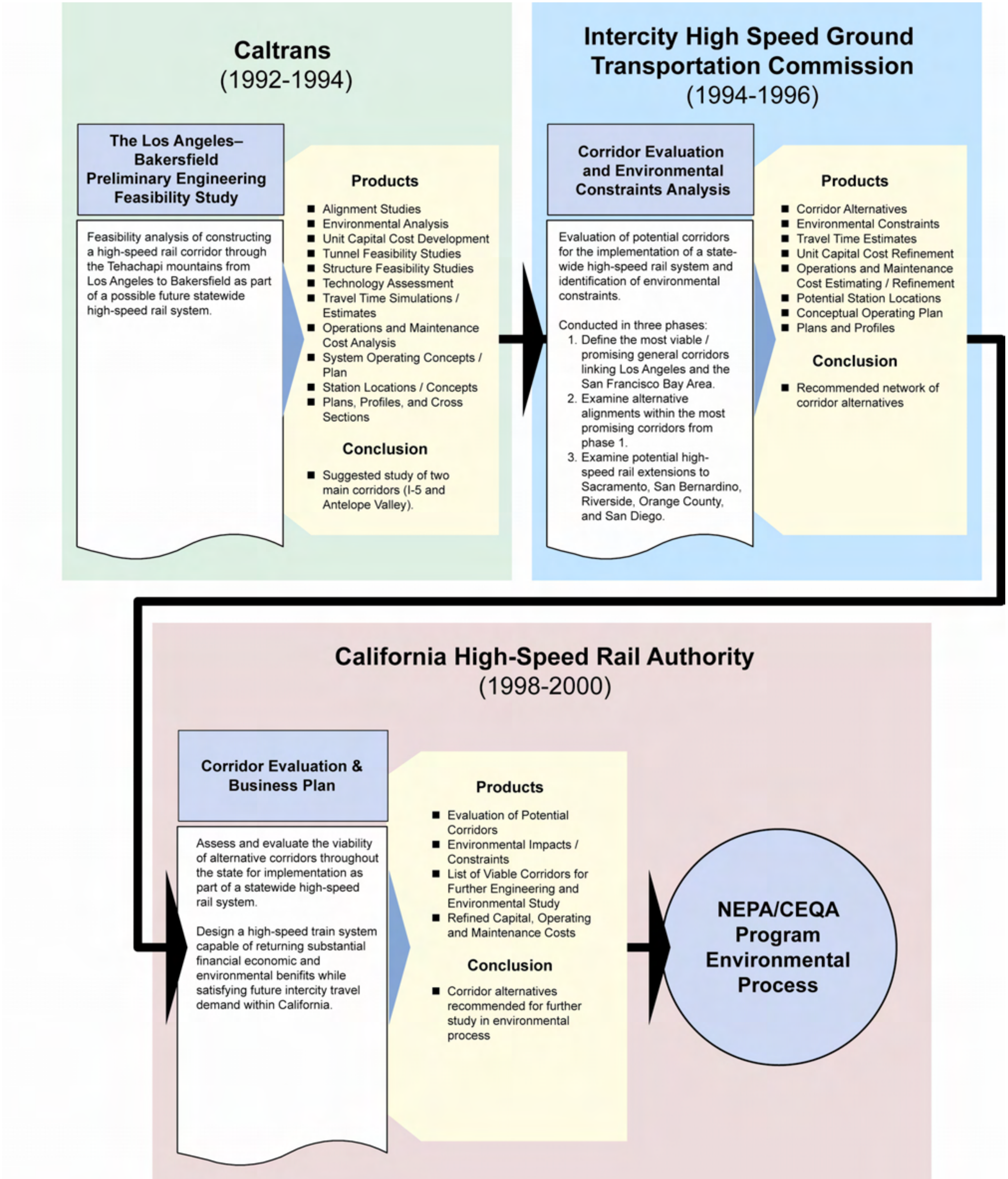


Figure 2.3-1
Relationship between Previous California High-Speed Train Studies

U.S. Department of Transportation
Federal Railroad Administration

Figure 2.3-2
Initial Phase Corridors
(Commission Studies, 1996)

Figure 2.3-3
Corridors for Continued Consideration
(Commission Studies, 1996)

- Carry at least 32 million intercity passengers and another 10 million commuters annually.
- Generate about $900 million in revenues and return an operational surplus of more than $300 million per year.

The Authority recommended initiating a formal environmental review process with a systemwide program-level EIR/EIS on the HST network described in the Business Plan.

2.3.2 Statewide Program EIR/EIS

The Authority certified the final statewide program EIR/EIS, and the FRA issued a Record of Decision for the more than 700-mile-long HST system in November 2005. This statewide process took 4 years to complete at a cost of about $20 million. The HST Alternative was the selected system alternative and was identified as the environmentally preferred alternative under NEPA, as well as the environmentally superior alternative under CEQA. To serve the same number of travelers as the HST system was projected to carry by 2020, California would have to build nearly 3,000 lane-miles of freeway, plus five new airport runways and 90 departure gates at a cost two to three times more than the HST Alternative. The program EIR/EIS concluded that high-speed trains can decrease dependency on foreign oil, preserve energy, decrease air pollutants, and discourage sprawl while having less impact on the natural environment than expanding highways and airports.

Preferred alignments and potential HST station location options were selected for most of the statewide HST system as part of the final program EIR/EIS. Between the San Francisco Bay Area and Central Valley, a broad corridor was identified for further evaluation (Figure 1.1-1). In November 2005, the Authority and FRA initiated the preparation of this separate next-tier Program EIR/EIS to address the choice of a corridor/general alignment and station locations in the San Francisco Bay Area to the Central Valley region of the HST system.

A. SELECTED HIGH-SPEED TRAIN SYSTEM ALTERNATIVE

The HST Alternative for the over 700-mile-long HST system connecting the major metropolitan areas in California was selected by the Authority and FRA with the statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005) and this prior decision forms the basis for the proposed action. HST alternatives considered in this Program EIR/EIS (Section 2.5) represent different ways to implement the HST system in the Bay Area to Central Valley study region. This section describes the characteristics of the HST system that were determined in the 2005 Authority and FRA decisions, to provide the framework necessary to evaluate the HST Alignment Alternatives and the HST Network Alternatives for this study region. Since the 2005 decision, a new high-speed rail ridership forecasting model, new travel demand forecasts, and a 2030 HST operating plan have been developed, as described in Section 2.3.3. These current models have updated and refined the selected HST Alignment Alternatives for further consideration of the HST system in this document.

Travel Times and Frequency of Service

Independent ridership and revenue forecasts (Charles River Associates 1996 and 2000) prepared for the Business Plan showed that competitive travel times and frequent service are essential to attract travelers to an HST system. For the HST system to be economically feasible, operating speeds over 200 mph (322 kph), high frequencies of service, and efficient operations are necessary. For this fundamental reason, the Authority and the FRA selected criteria that the proposed HST system would operate at speeds of up to about 220 mph (350 kph) and developed a conceptual service plan that makes the HST system highly competitive with travel by air or auto. It is important to note that maximum speeds cannot be achieved on many portions of the proposed system, particularly the heavily constrained urban areas (Figure 2.3-4). Express travel between downtown San Francisco and downtown Los Angeles could be accomplished in just over 2.5 hrs. The trip between downtown Los Angeles and downtown San Diego would take about 1 hour and 18 minutes. Table 2.3-1 shows current estimates of express travel times between a sample of the cities to be served.

Table 2.3-1
Optimal Express Travel Times (220 mph [350 kph])

Altamont Travel Time (hh:mm) / Pacheco Travel Time (hh:mm)	San Francisco	Oakland	San José	Sacramento	Fresno	Los Angeles	San Diego	
San Francisco	N/A	N/A	N/A	01:06	01:18	02:36	03:54	San Francisco
Oakland	N/A	N/A	N/A	00:53	01:04	02:23	03:40	Oakland
San José	00:30	00:22	N/A	00:49	01:01	02:19	03:37	San José
Sacramento	01:47	01:38	01:18	N/A	00:59	02:17	03:35	Sacramento
Fresno	01:20	01:12	00:51	00:53	N/A	01:24	02:42	Fresno
Los Angeles	02:38	02:30	02:09	02:11	01:24	N/A	01:18	Los Angeles
San Diego	03:56	03:48	03:27	03:29	02:42	01:18	N/A	San Diego
	San Francisco	Oakland	San Jose	Sacramento	Fresno	Los Angeles	San Diego	

N/A Not Applicable | Altamont Pass Test Alignment | Pacheco Pass Test Alignment

Note: Based on Altamont Pass Test Alignment B (I-580/UPRR) and Pacheco Pass Test Alignment B (Caltrain/Gilroy/Henry Miller/UPRR).

Ridership forecasts for the Pacheco Pass (terminating in San Francisco) and the Altamont Pass (terminating in San Francisco and San Jose) have been used as the *representative demand* for defining the intercity travel need for the HST Alignment Alternatives in this Program EIS/EIR.

The projected HST travel times account for alignment, train performance characteristics, acceleration and deceleration capabilities, and passenger comfort criteria. HST system operators and manufacturers of HST equipment were consulted in the development of the travel times and design criteria for the proposed HST system.

Safety and Security

The safe operation of the HST system would be of the utmost importance. To this end, the HST system would be a fully grade-separated and fully access-controlled guideway with intrusion monitoring systems. This means that the HST infrastructure (e.g., mainline tracks and maintenance and storage facilities) would be designed to prevent access by unauthorized vehicles, persons, animals, and objects. The capital cost estimates include allowances for appropriate barriers (fences and walls), state-of-the-art communication, access-control, and monitoring and detection systems. All aspects of the HST system would conform to the latest federal requirements regarding transportation security. The HST trainsets (train cars) would be pressure sealed to maintain passenger comfort regardless of aerodynamic changes along the line.

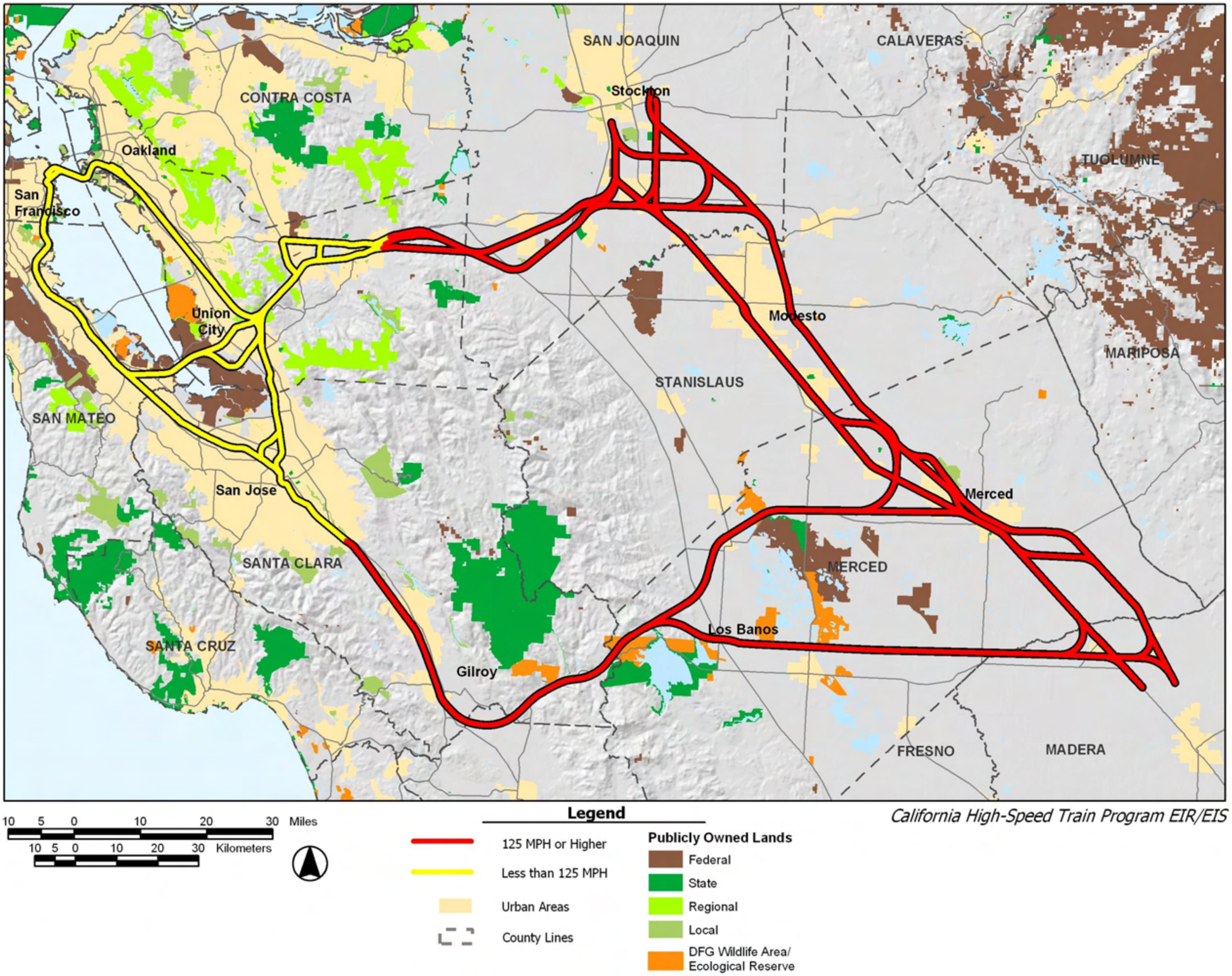


Figure 2.3-4
Potential Average Operating Speeds

Electrification

Trains would draw electric power from overhead wires connected to the commercial power grid and, in braking, would regenerate electricity back to the grid, thereby conserving power and reducing costs. The statewide program EIR/EIS energy analysis concluded that the HST system would have a net energy benefit as compared to the No Project Alternative but would result in an increase in electric power demand. This Program EIR/EIS assessed the total energy that would be needed from California's electricity grid to power and operate the proposed HST system from its commencement (a portion of the system) to full implementation. The HST system does not include the construction of a separate power source. The analysis concluded that sufficient electricity is expected to be available to power the proposed HST system, as segments are constructed and begin operating, because power generation is expected to grow to meet increased demand in the state, and the power needs of the proposed HST system represent a small part of that overall increase in demand.

The power supply would consist of a 2-by-25-kilovolt (kV) overhead catenary system for all electrified portions of the statewide system. Supply stations would be required at approximately 30-mile intervals. Based on the estimated power needs of this system, these stations would need to be approximately 20,000 square ft (200 ft by 100 ft). Switching stations would be required at approximately 15-mile intervals. These stations would need to be approximately 7,500 square ft (150 ft by 50 ft). Paralleling (booster) stations would be required at approximately 7.5-mile intervals. These stations would need to be approximately 5,000 square ft (100 ft by 50 ft). Each station would include a control house that would need to be approximately 800 square ft (40 ft by 20 ft). These facilities are not sited as part of the program-level of environmental review. However, the facilities defined fall well within the potentially affected environment areas considered in program-level studies. Facility placement, sizing, and spacing would be determined during subsequent project-level environmental review.

Potential for Freight Service

The proposed HST system could be used to carry small packages, parcels, letters, or any other freight that would not exceed typical passenger loads. This service could be provided either in specialized freight cars on passenger trains or on dedicated lightweight freight trains. In either case, the lightweight freight vehicles would be required to have the same performance characteristics as the passenger equipment. This type of freight could be accommodated without adjustment to the passenger operational plan or modification to the passenger stations and was therefore included in the funding scenario described in the Business Plan.

A high-speed freight service might also be provided on specialized medium-weight freight trains. This specialized freight equipment would have limited axle loads (19 metric tons compared to the conventional freight standard of 27 metric tons per axle), would operate at speeds of up to 125 mph (200 kph), and would be scheduled at night to avoid conflict with passenger or maintenance operations. A medium-weight freight service could carry high-value or time-sensitive goods such as electronic equipment and perishable items. Although such a service would not interfere with passenger operations, it would require loading and unloading facilities separate from the passenger stations. Additional pick-up and distribution networks for this type of freight might also be required. Although the Authority recognizes the potential for overnight medium-weight freight service on the proposed high-speed tracks, it has not been included in this analysis. Discussions with potential high-speed freight operators could be initiated as part of subsequent project development with appropriate analysis.

Performance Criteria

The Authority and the FRA previously defined performance criteria for the HST in the statewide program EIR/EIS for the HST system (California High-Speed Rail Authority and Federal Railroad

Administration 2005), drawing on many prior feasibility and corridor evaluation studies. To meet the travel time and service quality goals, the statewide HST system will be capable of speeds in excess of 200 mph (320 kph) on fully grade-separated tracks with state-of-the-art safety, signaling, and automated train control systems. These performance criteria are summarized in Table 2.3-2.

Table 2.3-2
HST Performance Criteria

Category	Criteria
System Design Criteria[1]	Electric propulsion system. Fully grade-separated guideway. Fully access-controlled guideway with intrusion monitoring systems. Track geometry must maintain passenger comfort criteria (smoothness of ride, lateral acceleration less than 0.1 g [G forces]).
System Capabilities	All-weather/all-season operation. Capable of sustained vertical gradient of 3.5% without considerable degradation in performance. Capable of operating parcel and special freight service as a secondary use. Capable of safe, comfortable, and efficient operation at speeds over 200 mph. Capable of maintaining operations at 3-minute headways. Capable of traveling from San Francisco to Los Angeles in approximately 2.5 hrs. Equipped with high-capacity and redundant communications systems capable of supporting fully automatic train control.
System Capacity	Fully dual track mainline with off-line station stopping tracks. Capable of accommodating a wide range of passenger demand (up to 26,000 passengers per hour per direction). Capable of accommodating normal maintenance activities without disruption to daily operations.
Level of Service	Capable of accommodating a wide range of service types (express, semi-express/limited stop, and local).

Description of High-Speed Train Technology

The selected HST Alternative (California High-Speed Rail Authority and Federal Railroad Administration 2005) consists of steel-wheel-on-steel-rail trains capable of meeting the Authority's performance criteria (Table 2.3-2) that would be able to share tracks at reduced speeds with other compatible train services. These high-speed trains are capable of maximum operating speeds up to 220 mph (350 kph) (Figure 2.3-5). All HST systems in operation around the world use electric propulsion with overhead catenary. These include the Train à Grande Vitesse (TGV) in France, the Shinkansen in Japan, and the InterCity Express (ICE) in Germany.

To operate at high speeds, a dedicated, fully grade-separated right-of-way is necessary with more stringent alignment requirements than those needed for lower-speed lines. Therefore, this state-of-the-art, high-speed, steel-wheel-on-steel-rail technology would operate in the majority of the statewide system in dedicated (exclusive track) configuration. However, where the construction of new separate HST infrastructure would be infeasible, shared track operations would use improved rail infrastructure and electrical propulsion. It would be possible to integrate HST systems into existing

1 *Engineering Criteria*, January 2004.

Intercity Express (ICE)

Shinkansen

conventional rail lines in the congested urban areas with resolution of potential equipment and operating compatibility issues by the FRA and the California Public Utilities Commission. Potential shared-use corridors would be limited to sections of the statewide system with extensive urban constraints. Shared-use corridors would meet the following general criteria in addition to the performance criteria:

- Uniform control/signal system.
- Four tracks at stations (to allow for through/express services and local stopping patterns).
- Three to four mainline tracks (depending on capacity requirements of HST and other services).
- Physical or temporal separation from conventional freight traffic.

Using this technology, the proposed HST system would be constructed with consistent dual tracking in a variety of construction sections (e.g., at grade, elevated structure, tunnel), as appropriate for the constraints of each specific section. These typical construction sections are illustrated in Figures 2.3-6, 2.3-7, and 2.3-8.

Design Practices

Design practices have also been identified that would be employed as the project is developed further in the project specific environmental review, final design, and construction stages. These practices will be applied to the implementation of the HST system to avoid, minimize, and mitigate potential impacts. Some key design practices are summarized below:

- Use of existing transportation corridors would be maximized. Nearly 70% of the adopted preferred HST alignments are either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way).
- Tracks that are fully grade separated from all roadways would be used.
- Multi-modal transportation hubs would be used.
- Electric power, high-quality track interface, and smaller, lighter, and more aerodynamic trainsets would be used, which would result in less noise than existing commuter and freight trains because HST do not have the rumble associated with diesel engines and use a design that greatly minimizes track noise.
- Transit-oriented design (TOD) and smart growth land use policies would be used. Station area development principles that would be applied at the project-level for each HST station and the areas around the stations would include:
  - Higher density development.
  - A mix of land uses (retail, office, hotels, entertainment, residential, etc.) and housing types to meet the needs of the local community.
  - A grid street pattern and compact pedestrian-oriented design that promotes walking, bicycle, and transit access.
  - Context-sensitive building design that considers the continuity of the building sizes and coordinates the street-level and upper-level architectural detailing, roof forms, and rhythm of windows and doors.
  - Limits on the amount and location of development-related parking, with a preference that parking be placed in structures.
- Portions of the system would be in tunnel or on aerial structure, which would avoid and/or minimize impacts to surface water resources.

- Measures to avoid water infiltration would be taken.
- Underpasses or overpasses or other appropriate passageways would be designed to avoid, minimize, and/or mitigate any potential impacts to wildlife movement.
- In-line construction would be used for sensitive areas, as defined at the project level.

2.3.3 Formulation of Alternatives for the Bay Area to Central Valley Region

With the initiation of this Program EIR/EIS, the Authority and the FRA began the process of defining reasonable and feasible HST Alignment Alternatives and station location options in the study region. The process involved consideration of the purpose and need for the proposed action and consultation with public agencies and the public, as described below.

A. AGENCY AND PUBLIC INVOLVEMENT AND SCOPING

Agency and public input was obtained during the scoping process pursuant to CEQA and NEPA. The notice of preparation (NOP) was released November 14, 2005, and the notice of intent (NOI) was published in the Federal Register on November 28, 2005. Written comments were received in response to these notifications.

Scoping activities for this Program EIR/EIS were conducted between November 15 and December 16, 2005. Because of the geographic extent and complexity of the proposed project, a series of six scoping meetings were held throughout the region, along with other meetings, briefings, and involvement activities. Each scoping meeting had an afternoon session (from 3:00 to 5:00 p.m.) and an evening session (from 6:00 to 8:00 p.m.) to accommodate agencies, interested parties, and the general public.

The Program EIR/EIS scoping process identified areas of potential concern related to the proposed HST system in the study region. Many comments related to a preference for either Altamont Pass or Pacheco Pass alignment alternatives. Many comments indicated the need for an improved statewide transportation system that is reliable, cost effective, and easy to use. Many comments emphasized the need for an HST system to connect to existing transportation systems, including airports. Providing for potential freight service was also a frequent theme, as was the need to separate HST and heavy freight operations. Issues of concern about the environment typically focused on potential noise and visual impacts, safety, and impacts on air quality and sensitive habitats. The potential for growth inducement was also raised. The scoping process and outcomes, including comments and concerns, are documented in the *Bay Area to Central Valley Scoping Report* (California High-Speed Rail Authority and Federal Railroad Administration 2006).

B. AGENCY INVOLVEMENT

Following the issuance of the NOI and NOP and the scoping meetings, the Authority and the FRA formed a working group of representatives from 27 federal and state agencies to assist in the environmental review process. The interagency group met during the Program EIS/EIR development to discuss major issues from the perspective of these agencies and to provide input to the lead agencies to help focus the analysis and streamline the review process.

The federal and state agency representatives included in this process were asked to provide input for the following specific areas:

- Scope of the Program EIR/EIS.
- Purpose and need statement.
- Technical methods of analysis and study area definition.

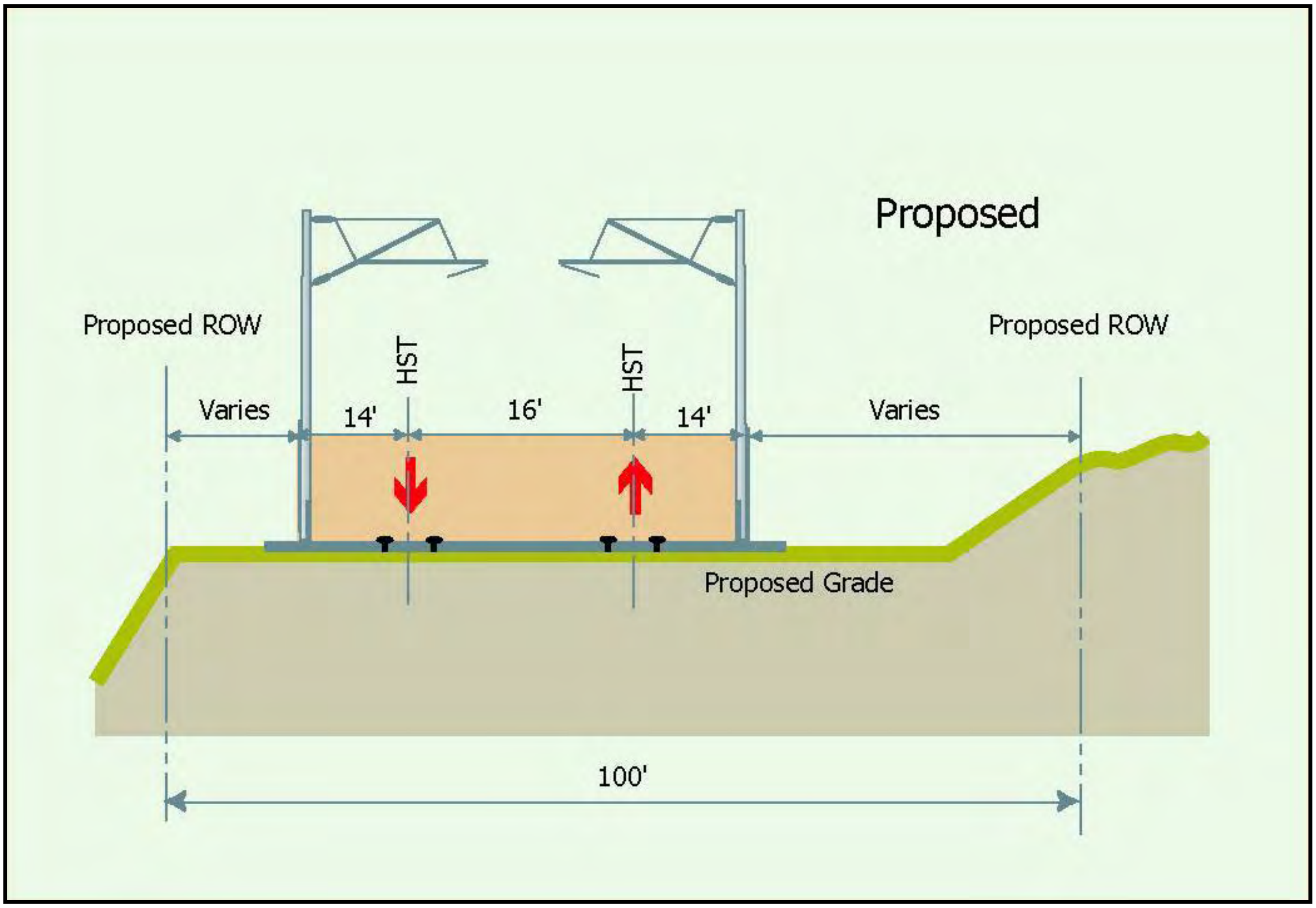


Figure 2.3-6
At-Grade Section

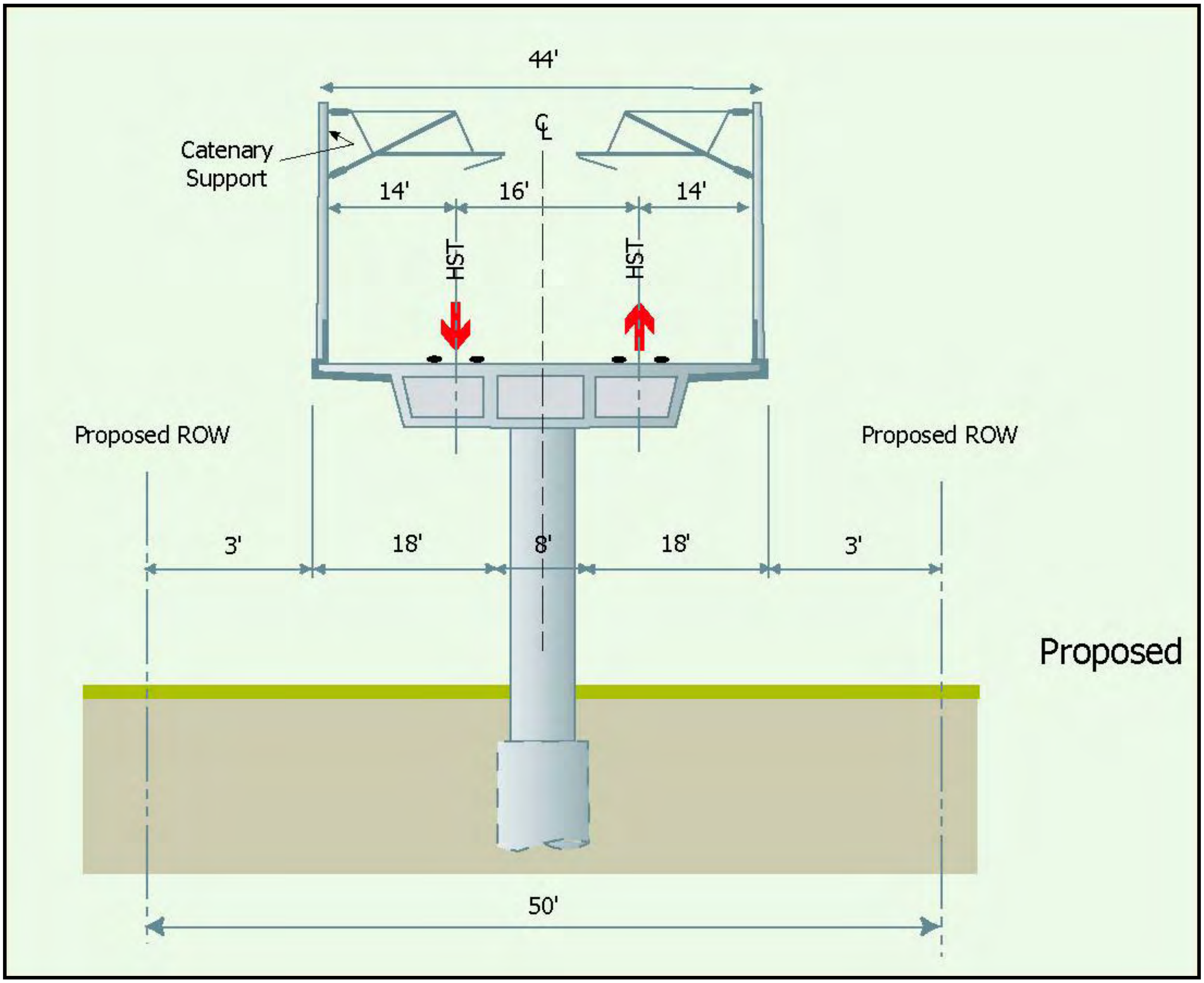


Figure 2.3-7
Elevated Structure

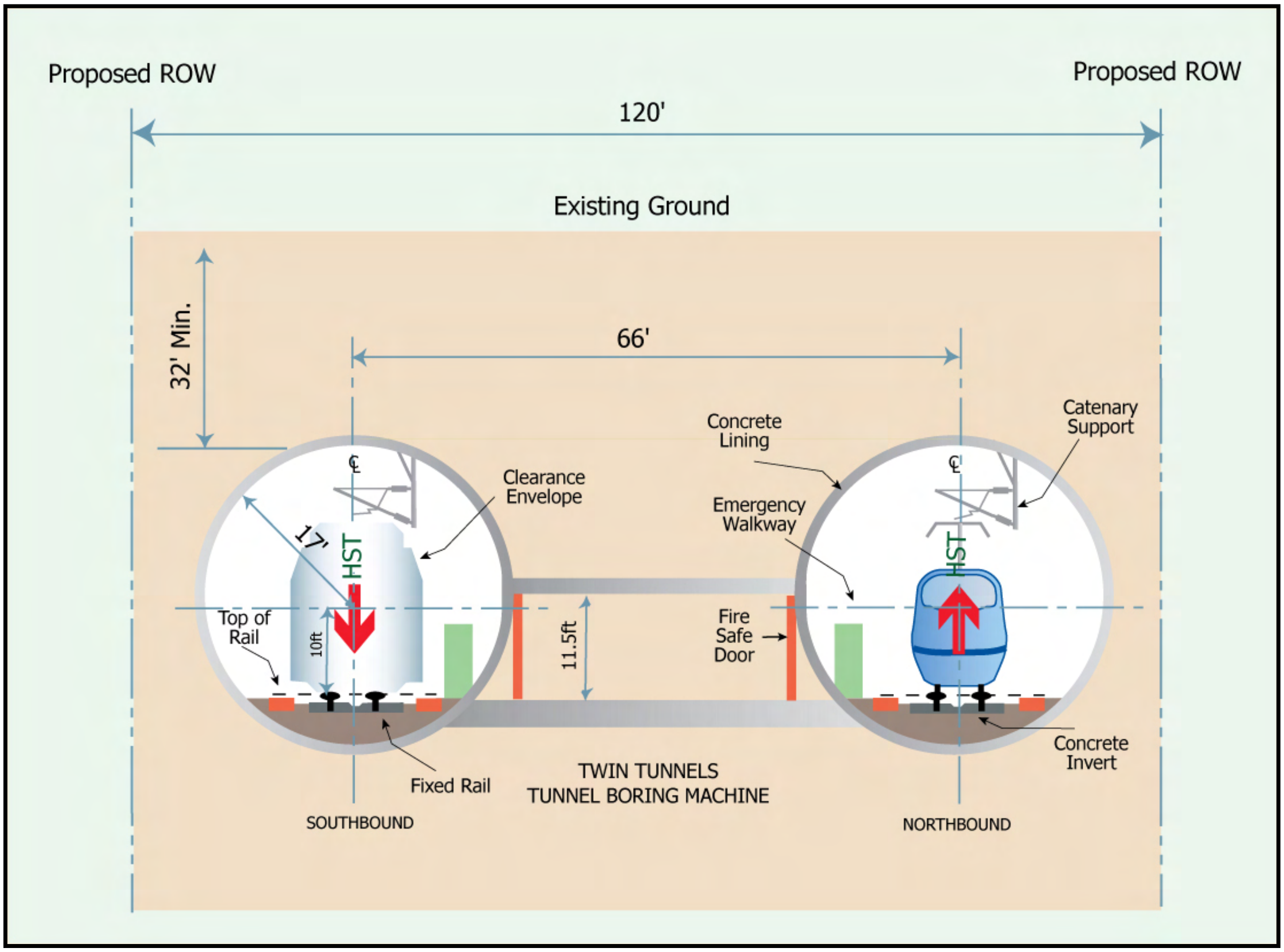


Figure 2.3-8
Twin Tunnels

- Substantive issues of particular concern.
- Sources of information and data relevant to their agencies.
- Avoidance, minimization, and mitigation strategies.
- Definition of alternatives to be analyzed in the Program EIR/EIS.
- Procedural requirements and permits or approvals necessary for subsequent phases of environmental review.

The Authority also invited input from regional and local agencies in areas potentially affected by the proposed HST system. Meetings of the Authority's governing board were also a forum for providing information about the environmental process. These meetings were held in major cities in the study region to provide a convenient opportunity for regional and local public participation and input.

As discussed in Section 1.1, the FRA is the lead federal agency for NEPA compliance, and federal cooperating agencies are the USACE and EPA. The FRA developed a memorandum of understanding (MOU) with the federal cooperating agencies to clarify expectations for the preparation and review of the Program EIR/EIS and for CWA Section 404 review. The federal cooperating agencies have met during the environmental review process to provide input to the Program EIR/EIS, and their involvement is expected to continue throughout the program environmental process.

C. TRAVEL DEMAND AND RIDERSHIP FORECASTS

Since previous ridership and revenue forecasts were prepared about 10 years ago for the Business Plan, a new intercity travel demand model was created by Cambridge Systematics for the MTC in partnership with the Authority to provide current and more refined ridership forecasts. New ridership forecasts were prepared using the new model in 2006 and 2007 to support continued development and environmental review of the proposed HST system. The model takes into account trends in travel demand, congestion, and other adverse travel conditions, which imply the market for intercity travel in California that the proposed HST system could serve will grow faster than the population by up to 46% over the next 30 years.

According to the base, or low, travel demand forecast prepared using the new model, the HST system would carry at least 88 million passengers per year by 2030 (Table 2.3-3). This estimate conservatively assumes current costs for air and automobile transportation would remain constant in real value. HST service plans were also adjusted to satisfy the new forecast for high-speed train travel demand. The proposed HST base ridership estimate also includes nearly 69,000 commuters riding every weekday by 2030, or about 25 million commuter passengers annually (out of the total 88 million annual riders). Analyses were also performed as part of the independent ridership and revenue forecasts (Cambridge Systematics 2007), using different assumptions for a 50% real increase in the costs for air and automobile travel, which resulted in a high forecast of potential ridership for the HST system of 117 million annual passengers for 2030 (36 million riders would be commuters) (Table 2.3-3).

Ridership for the HST system is now estimated to be between 88 million and 117 million passengers for 2030, with a potential for further ridership growth beyond 2030. These new ridership forecasts are higher than those analyzed in the previous program EIR/EIS for the HST system; however, this analysis is consistent with that provided in the previous document because the infrastructure and facilities footprints analyzed in that document would accommodate the new ridership forecasts. The purpose of and need for this project is to meet a part of California's future intercity travel demand in 2030 and beyond. Although the HST system would have the capacity to carry many more passengers than indicated in the high ridership forecast, by using longer trains, double-decker cars, or more frequent service (e.g., the Shinkansen system in Japan carries more than 300 million passengers annually), it is reasonable to assess the HST alternatives using forecast ridership rather than theoretical capacity.

For analysis of the proposed HST system in this Program EIR/EIS, both low and high forecasts were prepared for the No Project Alternative and two of the representative HST networks serving both San Francisco and San Jose (i.e., one for the Altamont corridor and one for the Pacheco corridor). The two representative HST networks defined the upper and lower bounds for the ridership forecasts. To assess relative changes between No Project and the HST alternatives where ridership is a governing factor, the appropriate forecasts were compared (i.e., high No Project to high HST or low No Project to low HST). The high ridership forecast of 117 million intercity trips, which includes the 36 million commuter trips figure, serves as the representative worst-case scenario for analyzing the potential environmental impacts from construction and operation of the HST system through 2030. This high forecast was generally used to define and develop the HST alternatives and is also referred to hereafter as the *representative demand*. In some specific analyses (e.g., energy, air quality, and transportation), the HST system would result in potential benefits. In those cases, analysis using the low ridership forecasts is used in this Program EIS/EIR.

Table 2.3-3
2030 Ridership Forecasts

Ridership Forecast	Year	Intercity Passengers Annually (millions)	Purpose
High [a]	2030	117 (includes 36 commuter trips)	Serves as a representative worst-case scenario for analyzing the potential for adverse environmental impacts from construction and operation of the HST system.
Low [b] (also called base)	2030	88 (includes 25 commuter trips) [c]	Used in analyses of beneficial effects from the HST system.

[a] Assumes a 50% real increase in costs for air and automobile transportation.
[b] Conservatively assumes current costs for air and automobile transportation.
[c] Included for analysis in 3.1, Traffic; 3.2, Travel Conditions; 3.3, Air Quality; and 3.5, Energy.

D. CONCEPTUAL SERVICE PLAN

To satisfy the travel time, service quality, and expected ridership (representative demand) criteria developed for the Business Plan, and accounting for the general characteristics of the corridors considered, the conceptual service plan must provide a wide variety of service options. A mix of express, semi-express, local, and regional trains would serve both intercity passengers and long-distance commuters. For HST service to be economically viable, train operations must be frequent and efficient.

According to the 2030 operating plan, a total of 124–139 weekday trains in each direction would be provided to serve the statewide HST travel market as forecast for the low- and high-end scenarios. Ninety-one to ninety-six of the trains would run between northern and southern California, and the remaining 33–43 trains would serve shorter distance markets. The basic service pattern would provide most passenger service between 6 a.m. and 8 p.m., with a few trains starting or finishing trips beyond these hours. One hundred and twenty-four to one hundred and thirty-nine trains per day could be a highly frequent operation; however, as shown below, when divided into five types of service, the frequency is greatly reduced. Frequencies would be further reduced to serve multiple end points. For example, for HST service between northern and southern California through the Central Valley, some trains would go to the Bay Area and others to Sacramento. Therefore, although there could be 19–25 local trains, only a portion of these would serve each endpoint. The following five types of intercity trains are planned:

- Express (16 trains per day): Trains running between Sacramento, San Jose, or San Francisco and Los Angeles or San Diego without intermediate stops.
- Semi-Express (17–26 trains per day): Trains running between Sacramento, San Jose, or San Francisco and Los Angeles and San Diego with intermediate stops at major Central Valley cities such as Modesto, Fresno, and Bakersfield.
- Suburban-Express (30–35 trains per day): Trains running between northern and southern California and locally within the major metropolitan areas (i.e., the San Francisco Bay Area and the Los Angeles area) at the beginning and end of the trip without intermediate stops in the Central Valley.
- Local (19–25 trains per day): Trains stopping at all stations. Some of these local trains might ultimately be operated as a “skip stop” or semi-express service, where trains would stop at only a portion of the possible stations on a specific line, to improve the service and better match patterns of demand.
- Regional (33–43 trains per day): Sacramento to San Francisco service and early morning service from the Central Valley to San Francisco or Los Angeles/San Diego.

E. HST ALIGNMENT ALTERNATIVES DEVELOPMENT

The development of the alternatives considered in this Program EIR/EIS incorporated the principles established for the HST Alternative selected in the statewide program EIR/EIS and set forth in the Business Plan to minimize capital and operating costs while maximizing total benefits. The FRA and the Authority recognized that the HST system would require a commitment of substantial resources and addressed the broad issues related to the development of a proposed HST system in the statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005). Based on the information developed in the earlier studies discussed above and the selected HST Alternative, as well as through public and agency coordination and scoping, the Authority and the FRA were able to identify potential alternatives for implementation of the proposed HST system in the study region.

The Authority and the FRA began developing the alternatives by seeking to identify the most reasonable, practicable, and environmentally sensitive HST Alignment Alternatives and station locations for analysis in this Program EIR/EIS. As part of this process, alternatives previously considered were reevaluated, and a screening of potential alignment alternatives and station location options was conducted. This screening analyzed all reasonable and practical alignment alternatives and station location options within viable HST corridors.

The evaluation of potential HST Alignment Alternatives and station location options used the following standardized criteria: construction, environment, land use compatibility, right-of-way, connectivity/accessibility, and ridership/revenue.

The screening of alignment alternatives and stations comprised the following key activities:

- Review of past alignment and station location options identified within viable corridors from previous studies.
- Identification through the environmental scoping process of alignment alternatives and station location options not previously evaluated.

- Evaluation of alignment alternatives and station location options using standardized engineering, environmental, and financial criteria (described above) and evaluation methodologies at a consistent level of analysis.
- Identification of the ability of alignment alternatives and station location options to meet defined objectives.

The results of this analysis were documented in the *Draft Alignment Alternatives and Potential Station Locations Options Report* (California High-Speed Rail Authority and Federal Railroad Administration 2006), presented at the Authority's March 22, 2006, Board Meeting, and in the *Additional Potential HST Alignment and Stations Considered but Rejected Report* (California High-Speed Rail Authority and Federal Railroad Administration 2006) presented at the Authority's August 9, 2006, Board Meeting. Technical data, combined with public and agency input, provided the Authority and the FRA with the necessary information to focus further studies for the Program EIR/EIS on those alignment alternatives, station location options, and HST systems that represent a reasonable range of practicable alternatives to meet the project purpose and attain several objectives established by the Authority. Those objectives include:

- Maximize ridership and revenue potential.
- Maximize connectivity and accessibility.
- Maximize compatibility with existing and planned development.
- Maximize avoidance of areas with geologic and soils constraints.
- Maximize avoidance of areas with potential hazardous materials.
- Minimize operating and capital costs.
- Minimize impacts on natural resources.
- Minimize impacts on social and economic resources.
- Minimize impacts on cultural resources.

Complex issues associated with the tunneling were addressed as part of the statewide program EIR/EIS process. This work focused on the feasibility, construction methods, and cost assumptions associated with proposed tunneling for the HST system and resulted in the Authority's objective of minimizing the amount of tunneling required, particularly the use of long tunnels (more than 6 mi [10 km] long), due to cost, time of construction, and potential for delay. Tunnels more than 12 mi (19 km) long are considered infeasible for this project, and it is the Authority's objective to cross major fault zones at grade. The technical information produced as part of the statewide program EIR/EIS is documented in the *Tunneling Issues Report* (California High-Speed Rail Authority January 2004).

F. RELATED PROGRAMS AND STUDIES

The purpose of the proposed HST system includes "interfaces between the HST system and major commercial airports, mass transit and the highway network" (Section 1.2.1). Planned commuter rail improvements in the study region described below are related and would connect to the proposed HST system. These plans and projects have been considered in the development of the HST Alignment Alternatives and station location options.

San Francisco Bay Area Regional Rail Plan

Approved by Bay Area voters in March 2004, the Regional Measure 2 (RM2) Traffic Relief Plan provides funding to various transit operating assistance and capital projects and programs that have been determined to facilitate travel in the toll bridge corridors. One provision of RM2 provides for the preparation of a Regional Rail Plan to guide near- and long-term planning for an integrated and expanded passenger rail system that would also accommodate freight needs (Streets and Highways Code Section 30914 [c] [33]). Additionally, RM2 calls for the analysis of alternative California HST alignments between the Central Valley and the Bay Area, which have been used to inform this Program EIR/EIS. These two RM2 study elements have been integrated to provide a fully comprehensive San Francisco Bay Area Regional Rail Plan. RM2 provides a $4.5 million budget for the study.

The MTC, BART, Caltrain, and the Authority, along with a coalition of rail passenger and freight operators, have prepared this comprehensive Regional Rail Plan. As required by RM2, MTC adopted the Regional Rail Plan in September 2007 (available at http://www.mtc.ca.gov/planning/rail/).

The Regional Rail Plan examines ways to incorporate passenger trains into existing rail systems, improve connections to other trains and transit, expand the regional rapid transit network, increase rail capacity, coordinate rail investment around transit-friendly communities and businesses, and identify functional and institutional consolidation opportunities. The plan also includes a detailed analysis of potential high-speed rail routes between the Bay Area and the Central Valley consistent with the Authority's environmental review of the proposed rail lines. Overall, the plan looks at improvements and extensions of railroad, rapid transit, and high-speed rail services for the near term (5–10 years), intermediate term (10–25 years), and long term (beyond 25 years).

The Regional Rail Plan is intended to create a rail network that addresses the anticipated growth in transportation demand and help deliver the long-range vision of rail for the Bay Area. The Regional Rail Plan's network and services are intended to:

- Address the combined challenges of moving people and goods.
- Link people with commercial, employment, and residential centers.
- Expand capacity for goods movements to support the regional economy.
- Identify the most cost-effective investments.
- Serve as the backbone of an integrated regional transit network with seamless connections at key transit hubs to local transit services.
- Accommodate development of statewide high-speed rail, and enable operation of regional services along high-speed lines, and vice-versa.
- Include policies and incentives to encourage local governments to create well-designed, walkable communities with a mix of services near transit.
- Promote a governance structure that can develop regional system improvements and deliver coordinated, customer-oriented services.

MTC, BART, Caltrain, and the Authority staffs are managing the Regional Rail Plan. As required in RM2, a steering committee consisting of regional rail passenger operators, freight railroad operators, and county congestion management agencies provided direction during the plan development. The steering committee was the forum for coordinated review and comment on the plan prior to its submission to MTC for approval. An advisory group of regional specialists in the fields of academia, business, land use, and the environment also helped to refine the study's technical analysis. Outreach to freight and rail operators, public agencies, and community stakeholders was ongoing throughout the study process.

Capitol Corridor Rail Service

The Capitol Corridor, having recently completed track improvements between Oakland and San Jose that allowed an increase in service frequency, is planning to implement a next phase of capacity increasing projects in the Oakland to San Jose corridor and a series of track improvements aimed at reliability in the Oakland to Sacramento corridor. A track capacity enhancement project is also planned for the Auburn to Sacramento corridor which will allow, in a phased project implementation approach, service frequency increases in this portion of the corridor. Projects previously programmed by the State include the Capitol Corridor Joint Powers Authority's (CCJPA's) contribution to the San Jose 4th Main Track project and the Bahia Track Improvement project.

With the recent passage of Proposition 1B, a series of projects that jointly benefit both freight and passenger rail are identified. The projects may include a revised Alameda Creek crossing in the Niles Junction area which will allow transfer of freight rail traffic to and from the Altamont Pass from the Oakland Port in a more expeditious route than is done currently running freight through Fremont. This improvement coupled with improvements at a junction point in South Hayward will allow passenger trains (Capitol Corridor and the planned Dumbarton Rail service) to avoid freight conflicts for a portion of the route between Oakland and San Jose. Double tracking is also planned north of the South Hayward point which will provide for additional track capacity for freight and passenger trains. A costly project planned for the route at some point will be to upgrade or replace the bridge crossing between Martinez and Benicia to avoid the conflicts created when waterborne vessels require the current bridge to be lifted. The anticipated increases in freight traffic coupled with passenger rail service are expected to become so frequent that the delays caused by bridge liftings could create catastrophic delays for all forms of rail service.

Caltrain Corridor Commuter Rail Service

The Caltrain Joint Powers Board (JPB) forecasts a robust increase in Caltrain ridership driven by population increase, work force increase, and convenience and economic influences. Reports generated by the Caltrain discuss the "pull" demand composed of elective riders who could chose the automobile but elect to ride the commuter rail system as a preferred provider. According to the Caltrain JPB, this latent demand has been proven to be real based on the extraordinary growth in ridership realized in 2005 and 2006.

The first 5 years of the Caltrain capital program focuses on a program called the State of Good Repair. This program concentrates on optimizing the current system's performance. The activities in this program range from improvements to the signaling and communications systems to replacing old bridges, from improving the approach speeds and flexibility at the San Francisco terminus to eliminating the last of the hold-out stations. The product of this portion of the program is an optimal condition of the current system which will enable larger programs with minimal impact to performance.

The current method of Caltrain operation will reach its maximum capacity in less than 5 years, even with the system improvements previously mentioned. Electrification, which is required for connection to the Transbay Transit Center and to accommodate the HST on the line, presents the JPB with two implementation options to consider, each with fundamental performance differences. The first option is to purchase electrified locomotives to haul standard passenger coaches that currently run on Caltrain. This solution is relatively low risk for the JPB and supports operations to the Transbay Transit Center. However, this solution is problematic for the Authority because standard North American rail equipment is not compatible with HSTs currently in service around the world, and the HST would require high-level platforms.

The second option for the JPB is to procure electric multiple units (EMUs) that would be compatible with the European or Japanese HSTs that the Authority may select (non-FRA compliant). This option would support operations to the Transbay Transit Center and shared corridor operations with the HST and offer the JPB more flexible trains with better performance characteristics. The JPB has found this solution to be cost effective on a lifecycle basis, but there is greater risk to the JPB in that the Authority, CPUC, FRA, and Union Pacific Railroad (UPRR) must all reach agreement for implementation.

Altamont Commuter Express Service

The San Joaquin Regional Rail Commission, which owns and operates the Altamont Commuter Express (ACE), operates four daily roundtrips, Monday–Friday between Stockton and San Jose through the Altamont Pass. The 86-mile ACE corridor directly serves three counties and eight cities between the Central Valley and the Silicon Valley. The trains stop at three San Joaquin stations (Stockton, Lathrop/Manteca, and Tracy), four Alameda County Stations (Livermore [2], Pleasanton, and Fremont), and in Santa Clara County (Santa Clara [2] and San Jose).

ACE is working with the UPRR to complete a major signal upgrade project between Fremont and Stockton to improve reliability and speed on the route. Over the next 5-year period, ACE will be implementing capital projects that improve reliability and increase speeds in the Stockton to Fremont section of the corridor.

ACE is completing two planning/implementation studies.

- The *ACE Corridor Analysis Study* is focused on identifying improvements to ACE Service, which includes the potential purchase of a separate agency-owned corridor for the ACE service and short haul freight between the Port of Oakland and the Central Valley, and providing a better connection to BART. The draft corridor analysis study was completed in August 2007.
- The *Expansion Opportunities Analysis* is looking at the expansion opportunities for commuter rail service. Corridors that are being reviewed are:
  - Merced to Sacramento.
  - Stockton to Oakland (Delta Route).
  - Los Banos to Tracy.

Dumbarton Rail Project

The March 2004 voter approval of RM2 included funding to reconstruct the out-of-service Dumbarton rail line between Southern Alameda County and the San Francisco Peninsula. The reconstructed rail bridge across the bay would be the key component in the establishment of the commuter rail service between the Union City BART station and the Caltrain line on the peninsula.

New trackway connections would also need to be constructed in the vicinity of the Union City BART station to provide the transfer connection. Service would begin at Union City in the morning and would carry commuters to the west bay via Union Pacific tracks in Fremont and Newark, continuing on the publicly owned and reconstructed Dumbarton segment. Rail equipment comparable to current Caltrain rolling stock is expected to be employed.

The reconstructed Dumbarton segment includes embankment, trestle structure, and two swing bridges; most of the segment is single track with limited passing sidings. New stations would be built in Menlo Park and Newark as well as at the Intermodal Station at Union City. The connections of the Dumbarton Line to Caltrain in Redwood City would also be improved as part of the project. The project is currently being considered for phased implementation due to funding constraints and the inability to reach a track sharing agreement with the Union Pacific Railroad. The initial phase would include the reconstruction of the publicly owned right of way between Newark and Redwood City.

Rail service would operate from a Newark station across the reconstructed bridge to Redwood City and Caltrain. A second component of the project, the Union City Intermodal Station, would also be constructed and utilized by the Capital Corridor service.

Environmental studies are now under preparation; preliminary engineering is also underway to refine the estimated cost for rehabilitating the bay-crossing structures. Local land use plans, both adopted or under preparation, support TOD at the project station locations.

While the Dumbarton Rail project might be able to be completed prior to implementation of the HST system, it conflicts with the proposed HST system and the JPB's Caltrain Corridor EMU option. Conventional trains to be used for the Dumbarton rail service would not be compatible with HSTs currently in service around the world, nor with the similar EMUs proposed for use by the JPB. The rehabilitated Dumbarton Bridge would still be a single track bridge that could not accommodate HST service should the Altamont Corridor with a bay crossing be selected. Alternatively, if high density regional rail service is developed in the future along this route, a double track bridge across the bay would likewise be necessary.

G. PROJECT PHASING

Building an HST system of over 700 miles would tax the state's resources, such as its financial, human, and material needs, and the Authority must deal with both environmental and engineering challenges. Like all the other HST networks implemented throughout the world, the Authority has determined that California HST system must be built in phases that are carefully planned; each phase in turn must be built in stages.

In order to better utilize limited resources, the Authority selected the first phase (Phase 1) and will concentrate most of its resources to the construction of that phase[2]. While placing emphasis on Phase 1, the Authority will also continue with necessary planning, environmental studies, and other activities to advance and preserve those routes and stations that are not included in Phase 1.

The major factors considered in the development of the phasing plan include the following:

- Availability of funds.
- The utility of each phase.
- Time needed for construction.
- Availability of public and private partners.
- Need for right-of-way acquisition.

The phasing decision took into consideration the cost, ridership, and revenue data presented to the Board on April 18, 2007. The phasing decision is also based on the following needs and goals:

- Early utilization of some segments.
- Some degree of local and regional participation in the early construction and funding.
- Serving many regions.
- Significant operating surplus to include a private partner in the construction and operation.
- Development of a high-speed segment of around 100 miles for building, testing, and commissioning the high-speed trainsets, equipment, and systems.

[2] At the May 23, 2007, Authority meeting in Sacramento.

FLY CALIFORNIA Without ever leaving the ground
U.S. Department of Transportation Federal Railroad Administration

- Completion in less than 10 years from today.

Phase 1: Anaheim to Los Angeles to Merced and the San Francisco Bay Area

Phase 1 connects the major metropolitan areas of the state while serving the fastest growing region, the Central Valley. Phase 1 is the backbone of the proposed HST system, producing the highest potential ridership and revenue, which in all likelihood will attract substantial private sector financing. Within Phase 1, the Authority will capitalize on early improvements already planned and underway for certain corridors as well as developing a high-speed train segment in the Central Valley that will provide for the commissioning and testing of the equipment.

The San Diego to Los Angeles section of the HST system is a later phase because the SCAG is continuing its studies aimed at magnetic levitation (Maglev) HST service between Los Angeles, Ontario, and Riverside. Similarly, in the San Diego region, the San Diego Association of Governments (SANDAG) will be studying the potential use of Maglev technology between San Diego and Riverside. The section from Merced to Sacramento is a later phase due to the lower ridership potential than the connection to the Bay Area.

2.4 No Project Alternative

The No Project Alternative describes the study region without implementation of the HST system and is the basis for comparison of the HST Alignment Alternatives. The No Project Alternative represents the state's transportation system (highway, air, and conventional rail) as it is currently and as it would be after implementation of programs or projects that are currently projected in RTPs, have identified funds for implementation, and are expected to be in place by 2030. This financially constrained level of infrastructure improvement (based on the expected federal, state, regional, and local funding) was analyzed in consideration of the considerable growth in population and transportation demand that is projected to occur by 2030. The No Project Alternative addresses the geographic area that serves the major destination markets for intercity travel and that would be served by the proposed HST system in the study region. This area extends generally from the San Francisco Bay Area and Sacramento through the Central Valley. Figure 2.4-1 illustrates the existing intercity transportation infrastructure that serves these major travel markets.

The No Project Alternative satisfies the statutory requirements under CEQA and NEPA for an alternative that does not include any new action or project beyond what is already committed. The No Project Alternative includes the existing and future statewide intercity transportation system based on programmed and funded improvements through 2030, according to the following sources of information.

- State Transportation Improvement Project (STIP).
- Regional Transportation Plans (RTPs), financially constrained projects for all modes of travel.
  - Transportation 2030 Plan for the San Francisco Bay Area, MTC, February 2005.
  - *2006 Metropolitan Transportation Plan,* Sacramento Area Council of Governments (SACOG), Adopted March 16, 2006.
  - *2004 Regional Transportation Plan*, Council of Fresno County Governments, Adopted July 22, 2004.
  - *2004 Regional Transportation Plan for Merced County*, Merced County Association of Governments (MCAG), Adopted August 19, 2004.
  - *2004 Regional Transportation Plan: Vision 2030*, San Joaquin Council of Governments.
  - *2004 Regional Transportation Plan*, Stanislaus Council of Governments, 2004.

- Airport plans
- Intercity passenger rail plans

The future improvements that would be part of the No Project Alternative are also included in the assumed future 2030 baseline conditions for the Study Region under the HST Network and Alignment Alternatives. The No Project Alternative includes highway, aviation, and conventional rail elements, as discussed below.

2.4.1 Highway Element

The No Project highway system that currently serves the intercity travel market in the study region proposed to be served by the HST Alternative includes the highways identified in Table 2.4-1 and illustrated in Figure 2.4-1. The No Project Alternative includes this existing highway system, as well as funded and programmed improvements on the intercity highway network based on financially constrained RTPs developed by regional transportation planning agencies. Intercity highway improvements included as part of the No Project Alternative include infrastructure projects, as well as intelligent transportation system (ITS) and other potential system improvements programmed to be in operation by 2030. The improvements consist primarily of individual interchange improvements and roadway widening projects on limited segments of the highway network. As such, the improvements do not cumulatively add considerable line capacity to the highway system. The intercity highway improvements included as part of the No Project Alternative are identified by county in Appendix 2-A. This list of projects is consistent with "the Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study" which supplied the ridership numbers for this EIR/EIS.

Table 2.4-1
Existing California Intercity Highway System

Interstate Highway	U.S. Highway	State Route
I-5	US-101	SR-14
I-80		SR-17
I-205		SR-24
I-280		SR-92
I-580		SR-99
I-680		SR-237
I-880		SR-237

2.4.2 Aviation Element

The air transportation system evaluated under the No Project Alternative consists of 5 airports that currently provide commercial service in the study region proposed to be served by the HST Alignment Alternatives (study area). The airports do not necessarily provide commercial service between the same intercity markets as the proposed HST system. These airports are illustrated in Figure 2.4-1 and listed below.

- San Francisco International Airport (SFO).
- Oakland International Airport (OAK).
- Norman Y. Mineta San Jose International Airport (SJC).
- Modesto City-County-Harry Sham Field (MOD).
- Merced Municipal/Macready Field (MCE).

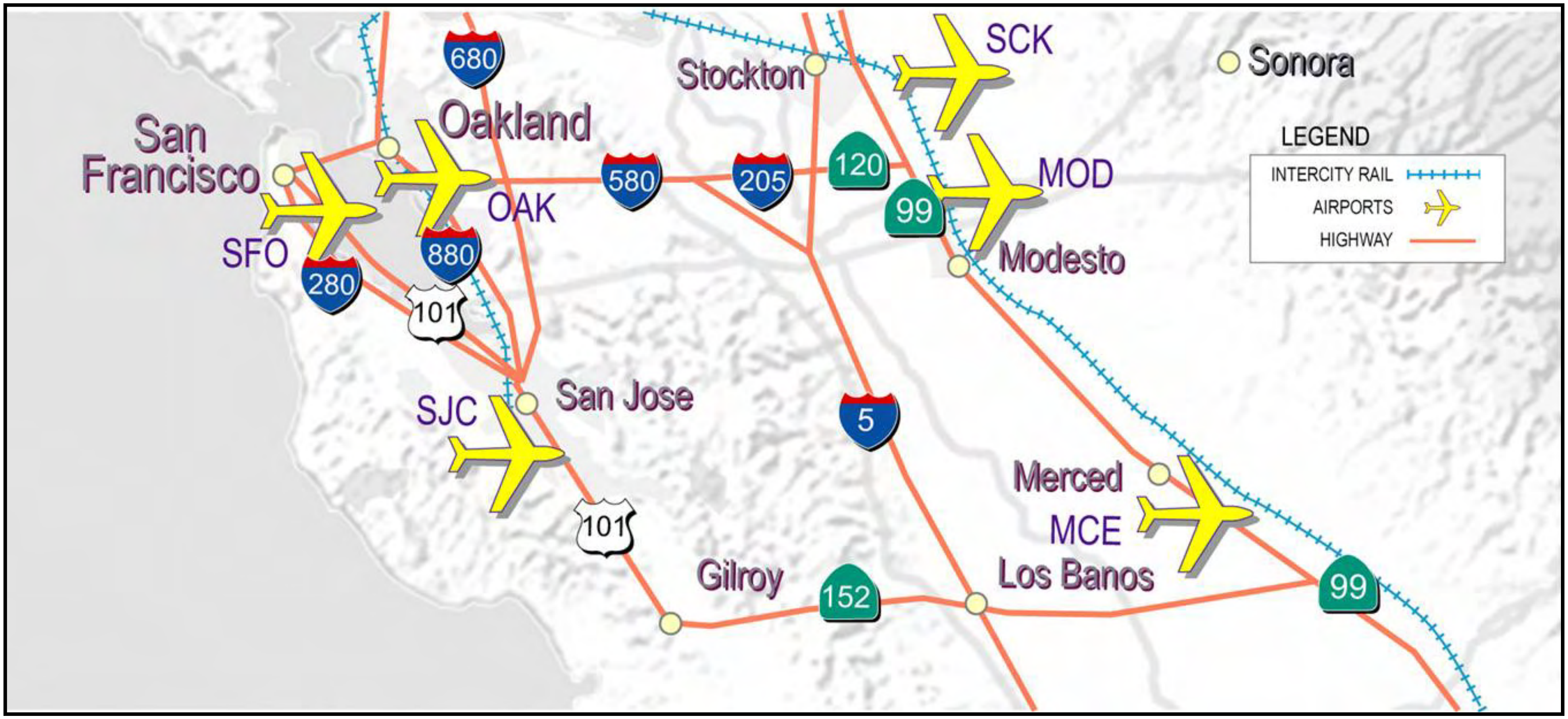


Figure 2.4-1
Study Area Transportation System

The airport development process is distinct from the highway and rail development processes and is not documented in local/regional transportation plans or in the STIP. In addition, because many airport improvements are funded with a combination of public and private funds, there is limited formal public documentation identifying committed projects that are likely to be operational by 2030.

For this analysis and to conceptualize a 2030 No Project airport system, criteria for airport development were developed to review proposed projects and determine their likelihood for implementation and operation by the year 2030. Proposed airport improvements were evaluated based on a review of available documentation, interviews with airport planning and development professionals, local area knowledge, and public agency input. An airport improvement is deemed likely to be implemented and operational by 2030 if the improvement meets the following criteria:

- Has been identified in an approved or under-development airport master planning program, environmental document, regional aviation system planning document, or capital improvement program, and
- Is reasonably practical to place into operation by 2030.

By applying this approach, the airport improvements likely to be funded, programmed, and operational by 2030 are summarized in Table 2.4-2.

Only a portion of the programmed, funded, and potentially operational improvements for 2030 are related to California intercity trips entirely made within the state. The projected aviation improvements were adjusted to represent only the intra-California proportional share, based on the Passenger Survey for California Market Demand in the *Official Airline Guide [OAG]* (Parsons Brinckerhoff 2002) as summarized in Table 2.4-3. The addition of this proportion of improvements to the existing 2001 airport facilities and aviation system is represented in the No Project Alternative. Appendix 2-B provides a detailed description of the aviation element of the No Project Alternative.

Table 2.4-2
Assumed Total Programmed, Funded, and Operational Airport Improvements[a]

Airport	Passenger Terminal Size (square feet)	Runways	Gates	Primary Access Lanes	Parking Spaces (On-/Off-Site)
Bay Area					
Oakland (OAK)	320,000	0	12	2[c]	10,000
San Jose (SJC)	500,000	0	17	2	6,400

[a] Total improvements assumed to be programmed, funded, and operational by 2030.

[b] The City and County of San Francisco and the FAA have commenced preparation of an EIR/EIS for a runway expansion/reconfiguration at SFO that may occur before 2030. It is not assumed as part of the No Project improvements because it does not meet the criteria as established.

[c] Includes the Oakland Airport Connector project, which is under construction. The connector is a 3 (approx.)-mile people mover, operating on exclusive guideway connecting the Oakland International Airport to the BART Coliseum Station.

Sources: Master planning and environmental documents, regional aviation system planning documents, and interviews with local area airport staff and airport planners (Chapter 12).

Table 2.4-3
Assumed Programmed, Funded, and Operational Improvements
Adjusted for Trips inside California*

Airport	Passenger Terminal Size (square feet)	Runways	Gates	Highway Lanes	Parking Spaces (On-/Off-Site)
Bay Area					
Oakland (OAK)	192,000	0	7	1	6,010
San Jose (SJC)	245,000	0	8	1	3,140

* Adjusted to represent the proportional share of improvements by 2030 for intercity California trips only. Assumed intercity California trips are Oakland 60% and San Jose 49%

Sources: *Official Airline Guide Passenger Survey for California Market Demand*, August 2002 and Parsons Brinckerhoff 2002.

2.4.3 Conventional Passenger Rail and Bay Area Transit Elements

Existing intercity passenger rail service is provided on four principal corridors covering more than 1,300 route mi (2,092 route km) and spanning almost the entire state. The No Project passenger rail network is composed of two of these corridors (Capitol corridor and San Joaquin corridor) as illustrated in Figure 2.4-1 and described below. Within these corridors, the intercity passenger service shares track with freight and/or commuter services. The primary portions of these corridors serve the same intercity markets as the proposed HST Alignment Alternatives. All the intercity passenger rail system improvements identified in the STIP and the Caltrans California Intercity Rail Capital Program for implementation prior to 2030 are included in the No Project Alternative and are identified in Appendix 2-C-2. To increase levels of passenger service, the improvements consist of additional track capacity, maintenance and storage facilities, grade-crossing improvements, track and signal improvements, and expanded or upgraded passenger stations.

The transit projects assumed as part of the No-Build project are listed in Appendix 2-C-1. This project list is consistent with the “Future Baseline” list assumed for the “Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study,” which provided the ridership numbers for this EIR/EIS.

2.5 High-Speed Train Alternatives

HST Network Alternatives represent different ways to combine HST Alignment Alternatives and station location options to implement the HST system in the study region. This Program EIR/EIS focuses on analysis and describes overall effects related to HST Alignment Alternatives. Because there are many possible combinations of alignments and stations, representative HST Network Alternatives are considered and described to better understand the implications of selection of certain alignment alternatives and station location options. Representative network alternatives are shown in Table 2.5-1.

The network alternatives vary in their ability to meet the purpose and need and objectives of the HST system and provide additional data to inform the future identification of preferred alignment alternatives and station location options. Although HST Alignment Alternatives and station location options were screened and evaluated to identify those that are likely to be reasonable and practicable and to meet the project’s purpose and need, the representative network alternatives have not yet been so evaluated. The network alternatives were developed to enable an evaluation and comparison of how various combinations of alignment alternatives would meet the project’s purpose and need and how each would perform as a HST network (e.g., travel times between various station locations, anticipated ridership, operating and maintenance costs, energy consumption, and auto trip diversions). Extensive summary data about the network alternatives are presented in Chapter 7, and important differences are identified to inform decision makers and the public in the Summary.

The different system characteristics, as well as environmental factors of the network alternatives, present complex choices. Informed by public review and comment on the draft Program EIR/EIS, the Authority prepared the evaluation for consideration by the Authority board after the public comment period. Chapter 8 of this final Program EIR/EIS presents this evaluation and identifies the preferred HST Alignment Alternatives and station location options, as well as the Preferred HST Network Alternative.

Table 2.5-1
Summary Table of Representative High-Speed Train Network Alternatives

Network Alternatives	Alignments for Representative Alternative
Altamont Pass	
San Francisco and San Jose Termini	Caltrain Corridor (San Francisco to Dumbarton) Dumbarton (High Bridge)[1] Niles/I-880 (Niles Junction to San Jose via I-880)[2] East Bay Connection (Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
Oakland and San Jose Termini	Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880)[2] East Bay Connections (Dumbarton/Niles XN and Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Francisco, Oakland, and San Jose Termini	Caltrain Corridor (San Francisco to Dumbarton) Dumbarton (High Bridge)[1] Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880)[2] East Bay Connections (Dumbarton/Niles XN and Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Jose Terminus	Niles /I-880 (Niles Junction to San Jose via I-880) [2] East Bay Connection (Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Francisco Terminus	Caltrain Corridor (San Francisco to Dumbarton) Dumbarton (High Bridge)[1] UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)

Network Alternatives	Alignments for Representative Alternative
Altamont Pass (continued)	
Oakland Terminus	Niles /I-880(West Oakland to Niles Junction) East Bay Connection (Dumbarton/Niles XN) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
Union City Terminus	Niles /I-880(Union City BART to Niles Junction) East Bay Connection (Dumbarton/Niles XN) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Francisco and San Jose – via SF Peninsula	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Dumbarton (High Bridge) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Francisco, San Jose, and Oakland – with no San Francisco Bay Crossing	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880)[2] East Bay Connections (Dumbarton/Niles XN and Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
Oakland and San Francisco – via Transbay Tube	Transbay Crossing – Transbay Transit Center Niles /I-880(West Oakland to Niles Junction) East Bay Connection (Dumbarton/Niles XN) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)
San Jose, Oakland, and San Francisco – via Transbay Tube	Transbay Crossing – Transbay Transit Center Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880)[2] East Bay Connections (Dumbarton/Niles XN and Dumbarton/Niles XS) UPRR (Niles to Altamont) Tracy Downtown (UPRR Connection) UPRR (Central Valley)

Pacheco Pass	
San Francisco and San Jose Termini	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR
Oakland and San Jose Termini	Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR
San Francisco, Oakland, and San Jose Termini	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR
San Jose Terminus	Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR
San Jose, San Francisco, and Oakland – via Transbay Tube	Transbay Crossing – Transbay Transit Center Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR
San Jose, Oakland, and San Francisco – via Transbay Tube	Transbay Crossing – Transbay Transit Center Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection BNSF - UPRR

Pacheco Pass with Altamont Pass (Local Service)	
San Francisco and San Jose Termini	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Dumbarton (High Bridge) UPRR (Niles to Altamont)[3] Tracy Downtown (UPRR Connection)[4] UPRR (Central Valley) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection
Oakland and San Jose Termini	Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880) East Bay Connections (Dumbarton/Niles XN & Dumbarton/Niles XS) UPRR (Niles to Altamont)[3] Tracy Downtown (UPRR Connection)[4] UPRR (Central Valley) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection
San Francisco, Oakland, and San Jose Termini (without Dumbarton Bridge)	Caltrain Corridor (San Francisco to Dumbarton) Caltrain (Dumbarton to San Jose) Niles /I-880(West Oakland to Niles Junction) Niles /I-880 (Niles Junction to San Jose via I-880) East Bay Connections (Dumbarton/Niles XN and Dumbarton/Niles XS) UPRR (Niles to Altamont)[3] Tracy Downtown (UPRR Connection)[4] UPRR (Central Valley) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection
San Jose Terminus	Niles /I-880 (Niles Junction to San Jose via I-880) [2] East Bay Connection (Dumbarton/Niles XS) UPRR (Niles to Altamont)[3] Tracy Downtown (UPRR Connection)[4] UPRR (Central Valley) Pacheco (San Jose to Western Valley) Henry Miller (Western Valley to BNSF/UPRR) Henry Miller UPRR Connection

1 Does not include Dumbarton Wye South to Caltrain segment.
2 Does not include Niles Junction to Niles Wye South (Niles/I-880 5A) segment.
3 Does not include "express tracks" through Pleasanton station.
4 Does not include "express tracks" through Tracy station.

2.5.1 HST Alignment Alternatives and Station Location Options

Informed by previous studies and the scoping process, the Authority and the FRA evaluated potential HST Alignment Alternatives in the study region and defined those that best meet the project purpose, which is *to provide a reliable high-speed electrified train system that links the major Bay Area cities to the Central Valley, Sacramento, and Southern California, and that delivers predictable and consistent travel times. Further objectives are to provide interfaces between the HST system and major commercial airports, mass transit and the highway network and to relieve capacity constraints of the existing transportation system in a manner sensitive to and protective of the Bay Area's and California's unique natural resources.* The study region is shown in Figure 1.1-1. The Authority and FRA conducted a screening evaluation to identify potential alignment alternatives and station location options that are anticipated to be practicable, reasonable, and feasible for further consideration in this Program EIR/EIS. These alignment alternatives and station location options are shown in Figure 2.5-1 and described as part of this section.

The screening evaluation included the following activities:

- Review of alignment alternatives and station location options identified in previous studies in the study region.
- Identification of alignment alternatives and station location options not previously evaluated.
- Evaluation of alignment alternatives and station location options using standardized engineering, environmental, and financial criteria and evaluation methodologies.
- Evaluation of alignment alternatives and station location options against defined objectives.

The alignment and station-screening evaluation was combined with public and agency input that together provided the Authority and the FRA with the necessary information to identify a reasonable range of alignment, station location, and HST corridor options. The evaluation of potential HST Alignment Alternatives and station location options within viable corridors used the following standardized criteria:

- Construction: Substantial engineering and construction complexity as well as excessive initial and/or recurring costs were considered criteria for project impracticability because they present logistical constraints.
- Environment: A high potential for considerable impacts to natural resources including water resources, streams, floodplains, wetlands, and habitat of threatened or endangered species was considered a criterion for failing to meet project objectives.
- Land Use Compatibility: Substantial incompatibility with current or planned local land use as defined in local plans was considered a criterion for failing to meet project objectives.
- Right-of-Way: A lack of available right-of-way or extensive right-of-way needs that would result in excessively high acquisition costs for a corridor, technology, alignment, or station were considered criteria for project impracticability.
- Connectivity/Accessibility: Limited connectivity with other transportation modes (aviation, highway, or transit systems) that would impair the service quality and could reduce ridership of the HST system was considered a criterion for failing to satisfy the project purpose.
- Ridership/Revenue: Longer trip times or suboptimal operating characteristics that would result in low ridership and revenue were considered criteria for failing to satisfy the project purpose.

Table 2.5-2 presents the relationship of objectives and criteria applied in the screening evaluation. The objectives and criteria used in this evaluation represent further refinement of those used in previous studies and incorporated the HST system performance goals and criteria. Alignment alternatives and station location options were considered and compared based on these established objectives and criteria.

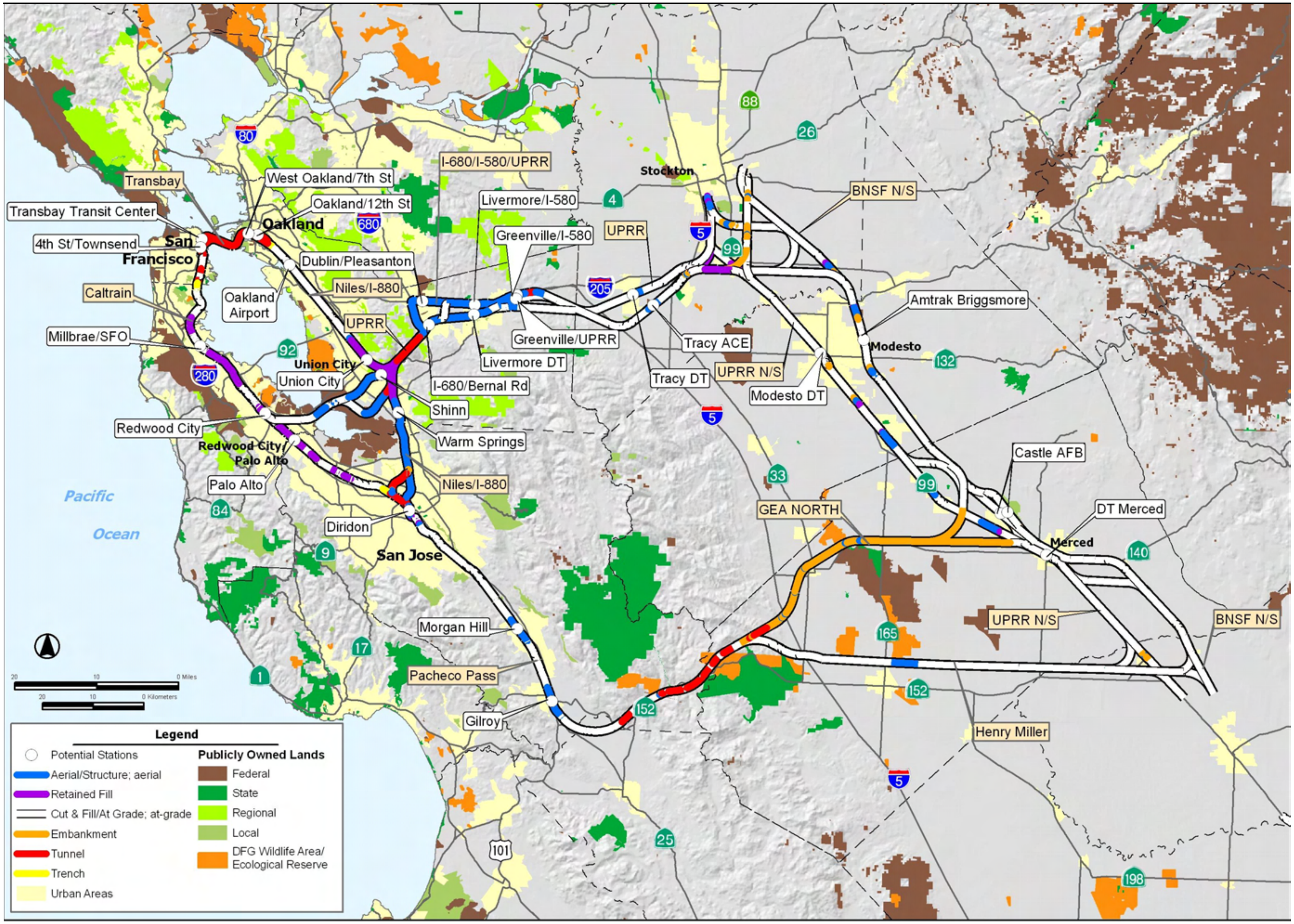
Table 2.5-2
High-Speed Rail Alignment and Station Evaluation Objectives and Criteria

Objective	Criteria
Maximize ridership/revenue potential	Travel time Length Population/employment catchment area
Maximize connectivity and accessibility	Intermodal connections
Minimize operating and capital costs	Length Operational issues Construction issues Capital cost Right-of-way issues/cost
Maximize compatibility with existing and planned development	Land use compatibility and conflicts Visual quality impacts
Minimize impacts on natural resources	Water resources impacts Floodplain impacts Wetland impacts Threatened and endangered species impacts
Minimize impacts on social and economic resources	Environmental justice impacts (demographics) Farmland impacts
Minimize impacts on cultural and parks/wildlife refuge resources	Cultural resources impacts Parks and recreation impacts Wildlife refuge impacts
Maximize avoidance of areas with geologic and soils constraints	Soils/slope constraints Seismic constraints
Maximize avoidance of areas with potential hazardous materials	Hazardous materials/waste constraints

Engineering criteria, such as operational, construction, and right-of-way issues, were evaluated qualitatively. The screening evaluation criteria are consistent with the criteria applied in the previous studies. The criteria related to HST operations are based on accepted engineering practices, the criteria and experiences of other railway and HST systems, and the comments of HST manufacturers.

The broad objectives and criteria related to the environment used for evaluation reflect the objectives of NEPA and CEQA and are consistent with the objective of the CWA Section 404(b)(1) to provide consideration of alternatives to minimize impacts on waters of the United States. The environmental constraints and impacts criteria focus on environmental issues that can affect the location or selection of alignments and stations.

The results of the alignment and station evaluation are described in the *Draft Alignment Alternatives and Potential Station Location Options Report* (California High-Speed Rail Authority and Federal Railroad Administration 2006), which was presented at the March 22, 2006, Authority Board meeting, and the *Additional Potential HST Alignments and Stations Considered but Rejected Report,* which was presented



U.S. Department of Transportation **Federal Railroad Administration**

Figure 2.5-1
Bay Area to Central Valley—High-Speed Train Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

at the August 9, 2006, Authority Board meeting. Some alignment alternatives and station location options were considered and removed from further study.

- For most of the alignment alternatives and station location options not carried forward, failure to meet the general project purpose and objectives and practicability constraints were the primary reasons for elimination.
- Environmental criteria were considered a reason for elimination when an alignment alternative or station location option had considerably more probable environmental impacts than other practicable alignment alternatives or station location options for the same corridor.
- General project purpose and objectives were considered in terms of ridership potential, connectivity and accessibility, incompatibility with existing or planned development, and severe operational constraints.
- Practicability constraints were considered in terms of cost, constructability, right-of-way constraints, and other technical issues. To assess the constructability of tunnels, some specific thresholds were established to help guide the evaluation. Continuous tunnel lengths of more than 12 mi (19 km) were considered impracticable, and the crossing of major fault zones at grade was also identified as a necessary criterion. For other practicability considerations (e.g., right-of-way constraints, construction issues, costs) thresholds could not be established for this program-level evaluation and impracticability was determined based on professional judgment.

Environmental constraints are identified for alignment alternatives only if they constituted primary reasons for elimination. The remaining alignment alternatives and station location options were determined to generally meet the objectives described in the purpose and need and are analyzed in detail in this Program EIR/EIS.

Proposed HST Alignment Alternatives are generally configured along or adjacent to existing rail transportation facilities, instead of creating new transportation corridors. Although a wide range of options have been considered, the Authority's initial conceptual approach, previous corridor evaluations, and the evaluation conducted as part of this Program EIR/EIS have consistently shown a potential for fewer substantial environmental impacts along existing highway and rail facilities than on new alignments through both developed and undeveloped areas. Although increasing the overall width of existing facilities could have potential impacts on the amount of land disturbed similar to those of creating new facilities, creating new facilities would also introduce potential incompatibility and severance issues in both urban communities and rural settings (farmlands, open spaces).

The station location options described in this section were identified generally and represent the most likely sites based on current knowledge, consistent with the objective to serve the state's major population centers. There is a critical tradeoff between accessibility of the system to potential passengers and the resulting HST travel times (i.e., more closely spaced stations will lengthen the travel times for local service as well as express services). The station locations shown here are spaced approximately 50 mi (80 km) apart in rural areas and 15 mi (24 km) apart in the metropolitan areas. Additional or more closely spaced stations would negatively affect travel times and the ability to operate both express and local services.

Several key factors were considered in identifying potential station stops, including speed, cost, local access times, potential connections with other modes of transportation, ridership potential, and distribution of population and major destinations along the route. Again, the ultimate locations and configurations of stations cannot be determined until the project-level environmental process has been completed.

As part of the development of the *Bay Area Regional Rail Plan* (Section 2.3.3), some HST Alignment Alternatives are being were considered for regional rail "overlay" services that would be implemented by other transportation agencies in cooperation with the Authority. Overlay services would involve operating regional commuter trains on the HST infrastructure and serving additional non-HST regional rail stations. These regional rail stations and services are not integral to the HST system and are not alternatives in this Program EIR/EIS; however, they are considered in the cumulative analysis of HST Alignment Alternatives as related but separate potential projects.

To facilitate this analysis, the study area was divided into six corridors within the study region:

- San Francisco to San Jose.
- Oakland to San Jose.
- San Jose to Central Valley.
- East Bay to Central Valley.
- San Francisco Bay Crossings.
- Central Valley Alignment.

These corridors connect different parts of the study region and are fundamentally different and distinct in terms of land use, terrain, and construction configuration (mix of at-grade, aerial structure, and tunnel sections). The HST Alignment Alternatives and station location options considered in each corridor of the study region are discussed below. Table 2.5-3 shows the HST Alignment Alternatives, which are made up of alignment segments. Table 2.5-3 also lists the segments by map name and location description. Figure 2.5-2 illustrates the segment breakdown of each of the alignment alternatives. The analyses in Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Strategies," compile and report information about the affected environment and environmental consequences for each alignment alternative and segment as outlined in the tables. The purpose of Chapter 7, "High-Speed Train Network and Alignment Alternatives Comparisons," is to summarize and compare the physical and operational characteristics and potential environmental consequences associated with the HST Network Alternatives and for the various HST Alignment Alternatives within the six corridors. The HST Alignment Alternatives and station location options are described below.

Table 2.5-3
Summary Table of Alignment Alternatives and Station Location Options

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c] Map Name (Figure 2.5-2)	Segment[c] Location Description
San Francisco to San Jose: Caltrain	1 of 1	San Francisco to Dumbarton	Caltrain 1	Transbay Transit Center to 4th/Townsend
			Caltrain 2	4th/Townsend to Millbrae/SFO
			Caltrain 3	Millbrae/SFO to Redwood City
			Caltrain 4	Redwood City to Caltrain
	1 of 1	Dumbarton to San Jose	Caltrain 5	Caltrain to Dumbarton Wye
			Caltrain 6	Dumbarton Wye to Palo Alto
			Caltrain 7	Palo Alto to Santa Clara
			Caltrain 8	Santa Clara to Diridon Station
Station Location Options				
Transbay Transit Center				

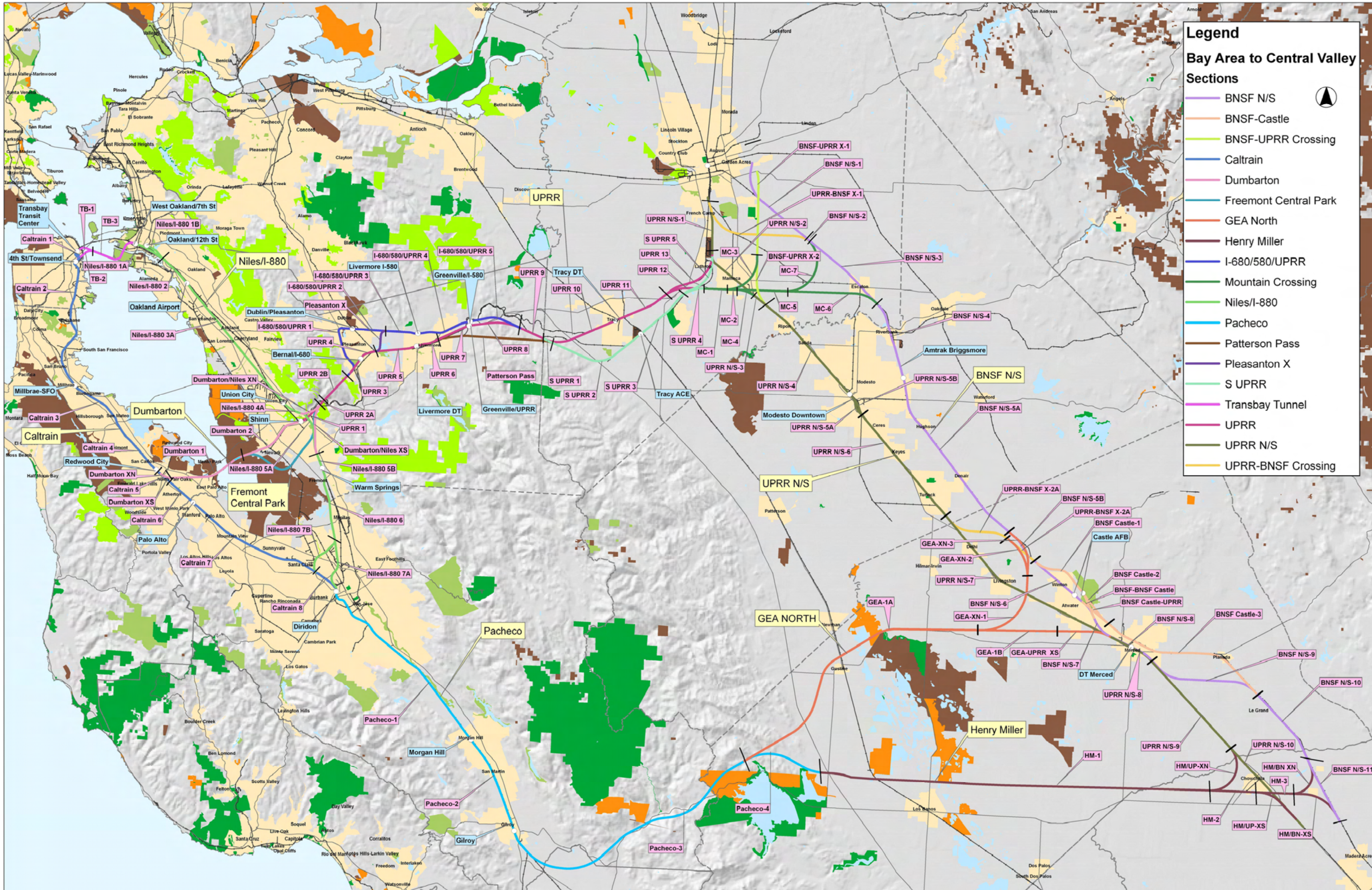


Figure 2.5-2
Alignment Segments and Station Location Options That Compose the High-Speed Train Alignment Alternatives

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	Location Description
4th and King (Caltrain)				
Millbrae/SFO				
Redwood City (Caltrain)				
Palo Alto (Caltrain)				
Oakland to San Jose: Niles/I-880	1 of 2	West Oakland to Niles Junction	Niles/I-880 1A	West Oakland to Jack London Square
			Niles/I-880 2 (A &B)	Jack London Square to Oakland Coliseum
			Niles/I-880 3A	Oakland Coliseum to Union City (BART)
			Niles/I-880 4A	Union City (BART) to Niles Junction
		12th Street/City Center to Niles Junction	Niles/I-880 1B	12th Street/City Center to Jack London Square Niles
			Niles/I-880 2 (A & B)	Jack London Square to Oakland Coliseum
			Niles/I-880 3A	Oakland Coliseum to Union City (BART)
			Niles/I-880 4A	Union City (BART) to Niles Junction
	1 of 2	Niles Junction to San Jose via Trimble	Niles/I-880 5A	Niles Junction to Niles Wye (S)
			Niles/I-880 5B	Niles Wye (S) to Warm Springs
			Niles/I-880 6	Warm Springs to Trimble Rd.
			Niles/I-880 7B	Trimble Rd. Option
			Caltrain 8	Santa Clara to Diridon Station
		Niles Junction to San Jose via I-880	Niles/I-880 5A	Niles Junction to Niles Wye (S)
			Niles/I-880 5B	Niles Wye (S) to Warm Springs
			Niles/I-880 6	Warm Springs to Trimble Rd.
			Niles/I-880 7A	I-880 – Trimble Rd. to Diridon
Station Location Options				
West Oakland/7th Street				
12th Street/City Center				
Coliseum/Airport				
Union City (BART)				
Fremont (Warm Springs)				
San Jose to Central Valley: Pacheco Pass	1 of 1	Pacheco	Pacheco 1	Diridon to Morgan Hill
			Pacheco 2	Morgan Hill to Gilroy
			Pacheco 3	Gilroy to San Luis Reservoir
	1 of 3	Henry Miller	Pacheco 4	San Luis Reservoir to Valley Floor

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	Location Description
		(UPRR Connection)	HM-1	Western Valley to Henry Miller UP Wye
			HM-2	Henry Miller UP North Wye to UP South Wye
			HM/UP-XN	Henry Miller Wye North to UPRR
			HM/UP-XS	Henry Miller Wye South to UPRR
		Henry Miller (BNSF Connection)	Pacheco 4	San Luis Reservoir to Valley Floor
			HM-1	Western Valley to Henry Miller UP Wye
			HM-2	Henry Miller UP North Wye to UP South Wye
			HM-3	Henry Miller UP South Wye to BNSF Wyes
			HM/BN-XN	Henry Miller Wye North to BNSF
			HM/BN-XS	Henry Miller Wye South to BNSF
		GEA North	GEA-1	San Luis Reservoir to Atwater Wye
			GEA-BNSF XN	GEA Atwater Wye North to BNSF
			GEA-UPRR XS	GEA Atwater Wye South to Merced UP
Station Location Options				
San Jose (Diridon)				
Morgan Hill (Caltrain)				
Gilroy (Caltrain)				
East Bay to Central Valley: Altamont Pass	1 of 4	I-680/ 580/UPRR	UPRR 2 (A & B)	Niles Canyon to Sunol
			I-680/580/UPRR 1	Sunol to Dublin/Pleasanton BART
			I-680/580/UPRR 2	Dublin/Pleasanton BART to El Charo Road
			I-680/580/UPRR 3	El Charo Road to Livermore (I-580)
			I-680/580/UPRR 4	Livermore (I-580) to Greenville
			I-680/580/UPRR 5	Greenville to Altamont Pass
			UPRR 9	Altamont Pass to County Line
		I-580/UPRR	UPRR 2 (A & B)	Niles Canyon to Sunol
			UPRR 3	Sunol to Pleasanton
			UPRR 4	Pleasanton to El Charo
			Pleasanton X	UPRR to I-580 connector
			I-680/580/UPRR 3	El Charo Road to Livermore (I-580)
			I-680/580/UPRR 4	Livermore (I-580) to Greenville
			I-680/580/UPRR 5	Greenville to Altamont Pass
			UPRR 9	Altamont Pass to County Line
		Patterson Pass/UPRR	UPRR 2 (A & B)	Niles Canyon to Sunol
			UPRR 3	Sunol to Pleasanton

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	**Location Description**
			UPRR 4	Pleasanton to El Charo
			UPRR 5	El Charo to Livermore
			UPRR 6	Livermore to Patterson Pass cut off
			Patterson Pass	Patterson Pass
		UPRR	UPRR 2 (A & B)	Niles Canyon to Sunol
			UPRR 3	Sunol to Pleasanton
			UPRR 4	Pleasanton to El Charo
			UPRR 5	El Charo to Livermore
			UPRR 6	Livermore to Patterson Pass cut off
			UPRR 7	Patterson Pass cut off to Greenville
			UPRR 8	Greenville to Altamont Pass
			UPRR 9	Altamont Pass to County Line
	1 of 4	Tracy Downtown (BNSF Connection)	UPRR 10	County Line to Tracy Downtown
			UPRR 11	Tracy Downtown to I-205
			UPRR 12	I-205 to S. UPRR
			UPRR 13	I-205 to Lathrop – northern
			MC-1	Southwestern Manteca
			MC-2	Southeastern Manteca
			MC-5	Northern Escaton Wye to BNSF
			MC-6	Southern Escaton Wye to BNSF (part 1)
			MC-7	Southern Escaton Wye to BNSF (part 2)
		Tracy ACE Station (BNSF Connection)	S UPRR 1	County Line to South of Tracy
			S UPRR 2	South of Tracy to Tracy ACE Station
			S UPRR 3	Tracy ACE Station to I-205
			S UPRR 4	I-205 to Southeast of Manteca
			S UPRR 5	I-205 to Lathrop – Southern
			MC-1	Southwestern Manteca
			MC-2	Southeastern Manteca
			MC-5	Northern Escaton Wye to BNSF
			MC-6	Southern Escaton Wye to BNSF (part 1)
			MC-7	Southern Escaton Wye to BNSF (part 2)
		Tracy ACE Station (UPRR Connection)	S UPRR 1	County Line to South of Tracy
			S UPRR 2	South of Tracy to Tracy ACE Station
			S UPRR 3	Tracy ACE Station to I-205
			S UPRR 4	I-205 to Southeast of Manteca
			MC-1	Southwestern Manteca

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	Location Description
			MC-2	Southeastern Manteca
			MC-3	Eastern Manteca UPRR South to BNSF
			MC-4	Manteca to Escaton Wye
		Tracy Downtown (UPRR Connection)	UPRR 10	County Line to Tracy Downtown
			UPRR 11	Tracy Downtown to I-205
			UPRR 12	I-205 to S. UPRR
			UPRR 13	I-205 to Lathrop – northern
			MC-1	Southwestern Manteca
			MC-2	Southeastern Manteca
			MC-3	Eastern Manteca UPRR South to BNSF
			MC-4	Manteca to Escaton Wye
	2 of 2	East Bay Connections	Dumbarton/Niles XN	Niles to Union City – Niles Wye (E) to Niles Wye (N)
			Dumbarton/Niles XS	Niles to Fremont – Niles Wye (E) to Niles Wye (S)
Station Location Options				
Pleasanton (I-680/Bernal Rd)				
Pleasanton (BART)				
Livermore (Downtown)				
Livermore (I-580)				
Livermore (Greenville Road/UPRR)				
Livermore (Greenville Road/I-580)				
Tracy (Downtown)				
Tracy (ACE)				
San Francisco Bay Crossings	1 of 2	Trans Bay Crossing – Transbay Transit Center	TB-1	Transbay Transit Center tube to SF Bay
			TB-3	SF Bay to West Oakland
		Trans Bay Crossing – 4th & King	TB-2	4th/Townsend tube to SF Bay
			TB-3	SF Bay to West Oakland
	1 of 6	Dumbarton (High Bridge)	Dumbarton XN	Dumbarton Wye North to Caltrain
			Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1 (High Bridge)	Dumbarton Bay Crossing to Don Edwards
			Dunbarton-2	Don Edwards to Shinn (Centerville Line)
			UPRR 1	Shinn to Niles Wye (E)
		Dumbarton	Dumbarton XN	Dumbarton Wye North to Caltrain

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	**Location Description**
		(Low Bridge)	Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1 (Low Bridge)	Dumbarton Bay Crossing to Don Edwards
			Dumbarton-2	Don Edwards to Shinn (Centerville Line)
			UPRR 1	Shinn to Niles Wye (E)
		Dumbarton (Tube)	Dumbarton XN	Dumbarton Wye North to Caltrain
			Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1 (Tube)	Dumbarton Bay Crossing to Don Edwards
			Dunbarton-2	Don Edwards to Shinn (Centerville Line)
			UPRR 1	Shinn to Niles Wye (E)
		Fremont Central Park (High Bridge)	Dumbarton XN	Dumbarton Wye North to Caltrain
			Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1	Dumbarton Bay Crossing to Don Edwards
			Fremont Central Park (High Bridge)	Don Edwards to Niles (E) via Fremont Central Park
		Fremont Central Park (Low Bridge)	Dumbarton XN	Dumbarton Wye North to Caltrain
			Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1	Dumbarton Bay Crossing to Don Edwards
			Fremont Central Park (Low Bridge)	Don Edwards to Niles Wye (E) via Fremont Central Park
		Fremont Central Park (Tube)	Dumbarton XN	Dumbarton Wye North to Caltrain
			Dumbarton XS	Dumbarton Wye South to Caltrain
			Dumbarton 1	Dumbarton Bay Crossing to Don Edwards
			Fremont Central Park (Tube)	Don Edwards to Niles Wye (E) via Fremont Central Park
Station Location Options				
Union City (Shinn)				
Central Valley	1 of 6	BNSF – UPRR	BNSF N/S 1	North Stockton South to UPRR Connection
			BNSF N/S 2	BNSF Parallel to UPRR tracks
			BNSF N/S 3	Parallel tracks South through Escaton
			BNSF N/S 4	Escaton South to Amtrak Briggsmore
			BNSF N/S 5	Amtrak Briggsmore to UPRR/BNSF Connection
			BNSF N/S 6	UPRR/BNSF Connection to Atwater

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	Location Description
			BNSF N/S 7	Atwater to Downtown Merced
			UPRR N/S 8	Merced South to BNSF Connection
			UPRR N/S 9	BNSF Connection South to Henry Miller Wye
			UPRR N/S 10	BNSF Henry Miller Wye
		BNSF	BNSF N/S 1	North Stockton South to UPRR Connection
			BNSF N/S 2	BNSF Parallel to UPRR tracks
			BNSF N/S 3	Parallel tracks South through Escaton
			BNSF N/S 4	Escaton South to Amtrak Briggsmore
			BNSF N/S 5	Amtrak Briggsmore to UPRR/BNSF Connection
			BNSF N/S 6	UPRR/BNSF Connection to Atwater
			BNSF N/S 7	Atwater to Downtown Merced
			BNSF N/S 8	Merced South to UPRR Connection
			BNSF N/S 9	UPRR Connection East to Castle Connection
			BNSF N/S 10	Castle Connection to Henry Miller Wye
			BNSF N/S 11	Henry Miller Wye
		UPRR N/S	UPRR N/S 1	French Camp to Lathrop
			UPRR N/S 2	Lathrop through Manteca
			UPRR N/S 3	Manteca South to BNSF/UPRR
			UPRR N/S 4	BNSF/UPRR South to Modesto
			UPRR N/S 5(A or B)	UPRR Modesto South – Western Option
			UPRR N/S 6	South Modesto to BNSF Connection
			UPRR N/S 7	BNSF Connection South to Merced
			UPRR N/S 8	Merced South to BNSF Connection
			UPRR N/S 9	BNSF Connection South to Henry Miller Wye
			UPRR N/S 10	BNSF Henry Miller Wye
		BNSF Castle	BNSF N/S 1	North Stockton South to UPRR Connection
			BNSF N/S 2	BNSF Parallel to UPRR tracks
			BNSF N/S 3	Parallel tracks South through Escaton
			BNSF N/S 4	Escaton South to Amtrak Briggsmore
			BNSF N/S 5	Amtrak Briggsmore to UPRR/BNSF Connection
			BNSF Castle 1	From BNSF southeast to Castle AFB

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	Location Description
			BNSF Castle 2	Castle AFB South to BNSF connect
			BNSF Castle 3	BNSF South of Castle to UPRR Connect
			BNSF N/S 10	Castle Connection to Henry Miller Wye
			BNSF N/S 11	Henry Miller Wye
		UPRR – BNSF Castle	UPRR N/S 1	French Camp to Lathrop
			UPRR N/S 2	Lathrop through Manteca
			UPRR N/S 3	Manteca South to BNSF/UPRR
			UPRR N/S 4	BNSF/UPRR South to Modesto
			UPRR N/S 5(A OR B)	UPRR Modesto South – Western Option
			UPRR N/S 6	South Modesto to BNSF Connection
			UPRR – BNSF X2	North South Connection East of Stockton (South Portion)
			BNSF Castle 1	From BNSF southeast to Castle AFB
			BNSF Castle 2	Castle AFB South to BNSF connect
			BNSF Castle 3	BNSF South of Castle to UPRR Connect
			BNSF N/S 10	Castle Connection to Henry Miller Wye
			BNSF N/S 11	Henry Miller Wye
		UPRR – BNSF	UPRR N/S 1	French Camp to Lathrop
			UPRR N/S 2	Lathrop through Manteca
			UPRR N/S 3	Manteca South to BNSF/UPRR
			UPRR N/S 4	BNSF/UPRR South to Modesto
			UPRR N/S 5(A OR B)	UPRR Modesto South – Western Option
			UPRR N/S 6	South Modesto to BNSF Connection
			UPRR – BNSF X2	BNSF crossing to UPRR – Southeast of Turlock
			BNSF N/S 6	UPRR/BNSF Connection to Atwater
			BNSF N/S 7	Atwater to Downtown Merced
			UPRR N/S 8	Merced South to BNSF Connection
			UPRR N/S 9	BNSF Connection South to Henry Miller Wye
			UPRR N/S 10	BNSF Henry Miller Wye
Station Location Options				
Modesto (Downtown)				
Briggsmore (Amtrak)				
Merced (Downtown)				

Corridor	Possible Alignments[a]	Alignment Alternative[b]	Segment[c]	
			Map Name (Figure 2.5-2)	**Location Description**
Castle AFB				

[a] Several alignment alternatives will be selected to create representative HST Network Alternatives (Chapter 7).

[b] Not every segment in an alignment would necessarily be selected to be considered as part of a network alternative.

[c] A segment may be part of more than one alignment alternative.

A. BAY AREA TO CENTRAL VALLEY ALIGNMENT ALTERNATIVES AND STATION LOCATION OPTIONS CARRIED FORWARD

The alignment alternatives and station location options analyzed in this Program EIR/EIS are shown in Figure 2.5-1. Several operating scenarios for combinations of terminus stations were investigated, with HST Network Alternatives ranging from one to three termini (San Francisco, Oakland, and San Jose) for direct HST service to the Bay Area. Conceptual designs were developed for all of the alignment alternatives and station location options carried forward. These designs are illustrated in plan and profile sheets (Appendix 2-D), cross sections (Appendix 2-E), and station fact sheets (Appendix 2-F). Conceptual designs are based on *Engineering Criteria* (California High-Speed Rail Authority and Federal Railroad Administration 2004). Maps illustrating the horizontal alignment and profile type (aerial, at grade, or tunnel) are shown in Figure 2.5-3.

The relation of each of the alignment alternatives to other existing transportation facilities is also a key aspect of the conceptual designs. This information defines the general physical characteristics of the alternatives for consideration in the environmental technical analyses presented in this Program EIR/EIS. Figure 2.5-4 illustrates the alignment characteristics (relation to existing corridors and proposed configurations) for the alignment alternatives carried forward.

San Francisco to San Jose

The alignment alternatives and station location options in this corridor carried forward for further consideration are illustrated in Figure 2.5-5 and discussed below.

Alignment Alternatives Carried Forward

- Caltrain Alignment (Shared-Use Four-Track): From San Francisco, this alignment alternative would follow south along the Caltrain rail alignment to Dumbarton and from there to San Jose. This alignment alternative assumes that the HST system would share tracks with Caltrain commuter trains. The entire alignment would be grade separated. Station location options would include a station in the lower level of the proposed new Transbay Transit Center in San Francisco or a station at 4th and King Streets, a station in Millbrae to serve SFO, and a station in either Redwood City or Palo Alto. The Caltrain shared-use alignment would take advantage of the existing rail infrastructure and would be mostly at-grade.

Station Location Options Carried Forward

San Francisco

- Transbay Transit Center: This potential station location would serve the Caltrain shared-use alignment as a downtown terminal station.
- 4th and King (Caltrain): This potential station location would serve the Caltrain shared-use four-track alignment as a downtown terminal station.

San Francisco International Airport

- Millbrae: This potential station would serve as a connection with SFO.

Mid-Peninsula

- Redwood City (Caltrain): This potential station location would provide accessibility and serve the population between San Jose and San Francisco.
- Palo Alto (Caltrain): This potential station location would provide accessibility and serve the population between San Jose and San Francisco.

Oakland to San Jose

The alignment alternatives and station location options in this corridor carried forward for further consideration are illustrated in Figure 2.5-6 and discussed below. Figure 2.5-6A shows greater detail around Niles Junction.

Alignment Alternatives Carried Forward

- Niles Subdivision Line to I-880 (Niles/I-880): From Oakland, this alignment alternative would travel south following the UPRR's Niles Subdivision Line (i.e., Hayward Line) transition to the UPRR's Warm Springs Subdivision (Milpitas Line) at Niles Junction and then transition to the I-880. Station location options include Oakland, Oakland Airport and Union City (BART) or Fremont (Warm Springs).

  The alignment would be at-grade along the Niles Subdivision Line and on an aerial structure in the median of I-880. The I-880 HST portion would mostly be on an aerial configuration from Fremont to San Jose. This alignment would require the construction of columns and footings in the wide median of I-880.

- Niles Subdivision Line to I-880 to Trimble Road (Niles/I-880/Trimble Rd.): From Oakland, this alignment alternative would travel south following the UPRR's Niles Subdivision Line (i.e., Hayward Line), transition to the UPRR's Warm Springs Subdivision (Milpitas Line) at Niles Junction and then transition to I-880 and then to Trimble Road. Station location options include Oakland, Oakland Airport, and Union City (BART) or Fremont (Warm Springs).

  The alignment would be at-grade along the Niles Subdivision Line and on an aerial structure in the median of I-880. The I-880 HST portion would mostly be on an aerial configuration from Fremont to San Jose. The Trimble Road segment would be on an aerial structure and in a tunnel (where adjacent to San Jose International Airport). This alignment would require the construction of columns and footings in the wide median of I-880.

Station Location Options Carried Forward

Oakland

- West Oakland: This potential station location would serve Oakland the Niles/I-880 Alignment.
- 12th Street/City Center: This potential station location would serve Oakland from the Niles/I-880 Alignment

Oakland International Airport

- Coliseum/Airport BART Station: This potential station location would serve the Oakland Airport from the Niles/I-880 Line.

Southern Alameda County

- Union City (BART): This potential station location would serve the population centers between Oakland and San Jose from the Niles/ I-880 Line.
- Fremont (Warm Springs): This potential station location would serve the population centers between Oakland and San Jose from the Niles/ I-880 Line.

San Jose to Central Valley

The alignment alternatives and station location options in this corridor carried forward for further consideration are illustrated in Figure 2.5-7 and discussed below.

Alignment Alternatives Carried Forward
Pacheco Pass Alignments

- Caltrain/Pacheco/Henry Miller Avenue: This alignment alternative would extend south along the Caltrain/UPRR rail corridor through the Pacheco Pass and a portion of the Grasslands Ecological Area (GEA) along Henry Miller Road and then across the San Joaquin Valley. Station location options include the existing San Jose (Diridon) Station and Gilroy (near the existing Caltrain Station) or Morgan Hill (near the existing Caltrain Station).
- Caltrain/Pacheco/GEA North/Merced: This alignment alternative would extend south along the Caltrain/UPRR rail corridor through the Pacheco Pass, pass through the northern portion of the GEA and then across the San Joaquin Valley. Station location options include the existing San Jose (Diridon) Station and Morgan Hill (near the existing Caltrain Station) or Gilroy (near the existing Caltrain Station).

Station Location Options Carried Forward
San Jose

- San Jose (Diridon): This potential station location would serve all alignments (Caltrain/Monterey Highway rights-of-way) out of San Jose.

South Santa Clara County

- Morgan Hill (Caltrain): This potential station location would serve all the Pacheco Pass alignment alternatives.
- Gilroy (Caltrain): This potential station location would serve all the Pacheco Pass alignment alternatives.

East Bay to Central Valley

The alignment alternatives and station locations in this corridor carried forward for further consideration are illustrated in Figure 2.5-8 and discussed below.

Alignment Alternatives Carried Forward
Altamont Pass

- UPRR: This alignment alternative would extend east via a relatively direct routing (mostly in tunnel) between Niles Junction and I-680 then use the UPRR alignment through Pleasanton and Livermore before transitioning to the I-580 corridor through the Altamont Pass to Tracy. Station location options include the Pleasanton (Bernal/I-680) Station, Livermore (near downtown), or Livermore (Greenville Rd.) and Tracy (downtown) or Tracy (ACE).
- I-580/UPRR: This alignment alternative would extend east via a relatively direct routing (mostly in tunnel) between Niles Junction and I-680 then use the UPRR alignment through Pleasanton before transitioning to the I-580 corridor through Livermore and the Altamont Pass to Tracy. Station location options include the Pleasanton (Bernal/I-680) Station, Livermore (I-580), or Livermore (Greenville Rd.) and Tracy (downtown) or Tracy (ACE).
- I-580/I-680/UPRR: This alignment alternative would extend east via a relatively direct routing (mostly in tunnel) between Niles Junction and I-680 then use the I-680 alignment before transitioning I-580 corridor (at the I-580/I-680 junction). Station location options include the Pleasanton (BART) Station, Livermore (I-580), or Livermore (Greenville Rd.) and Tracy (downtown) or Tracy (ACE).

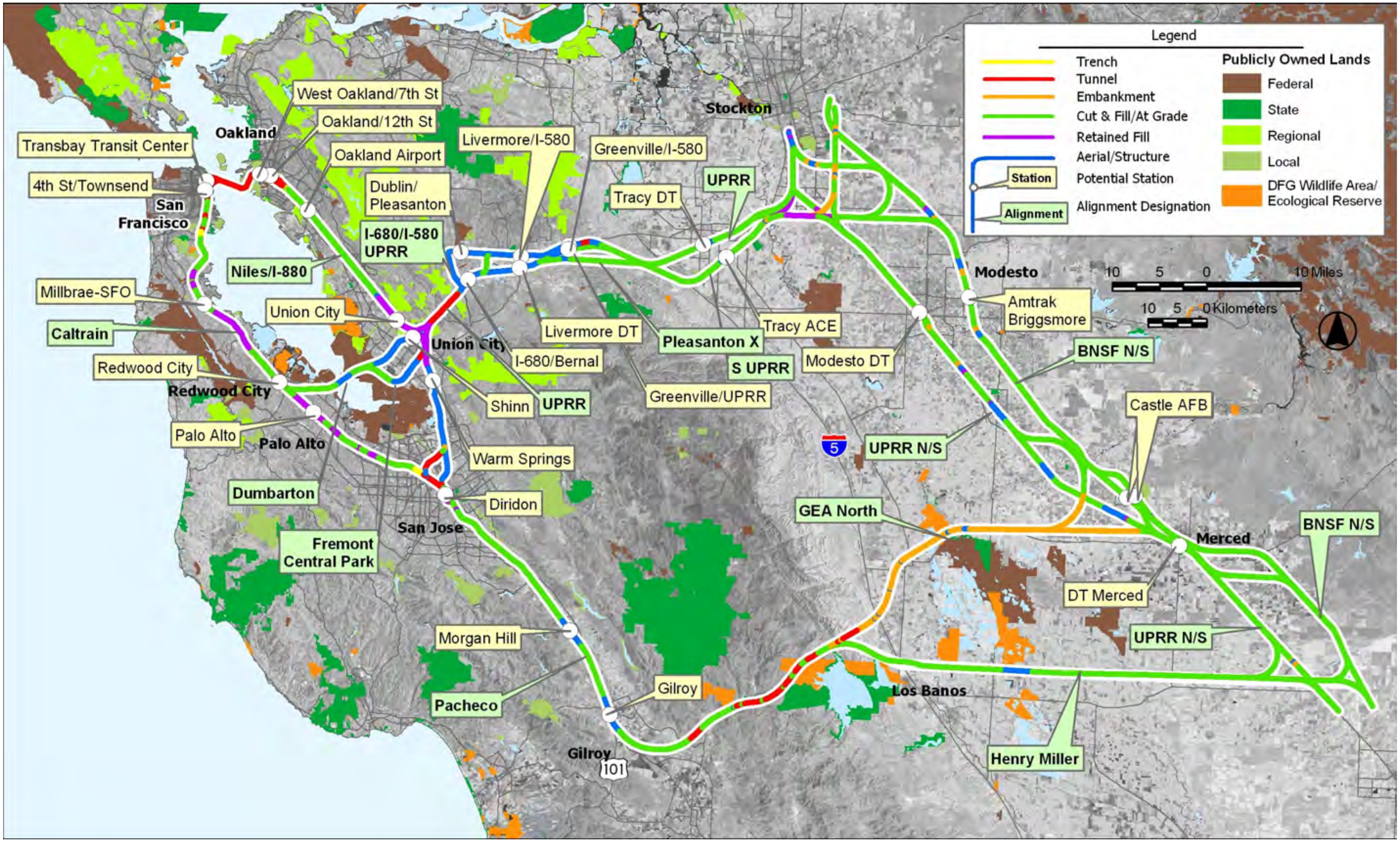


Figure 2.5-3
Profile Characteristics

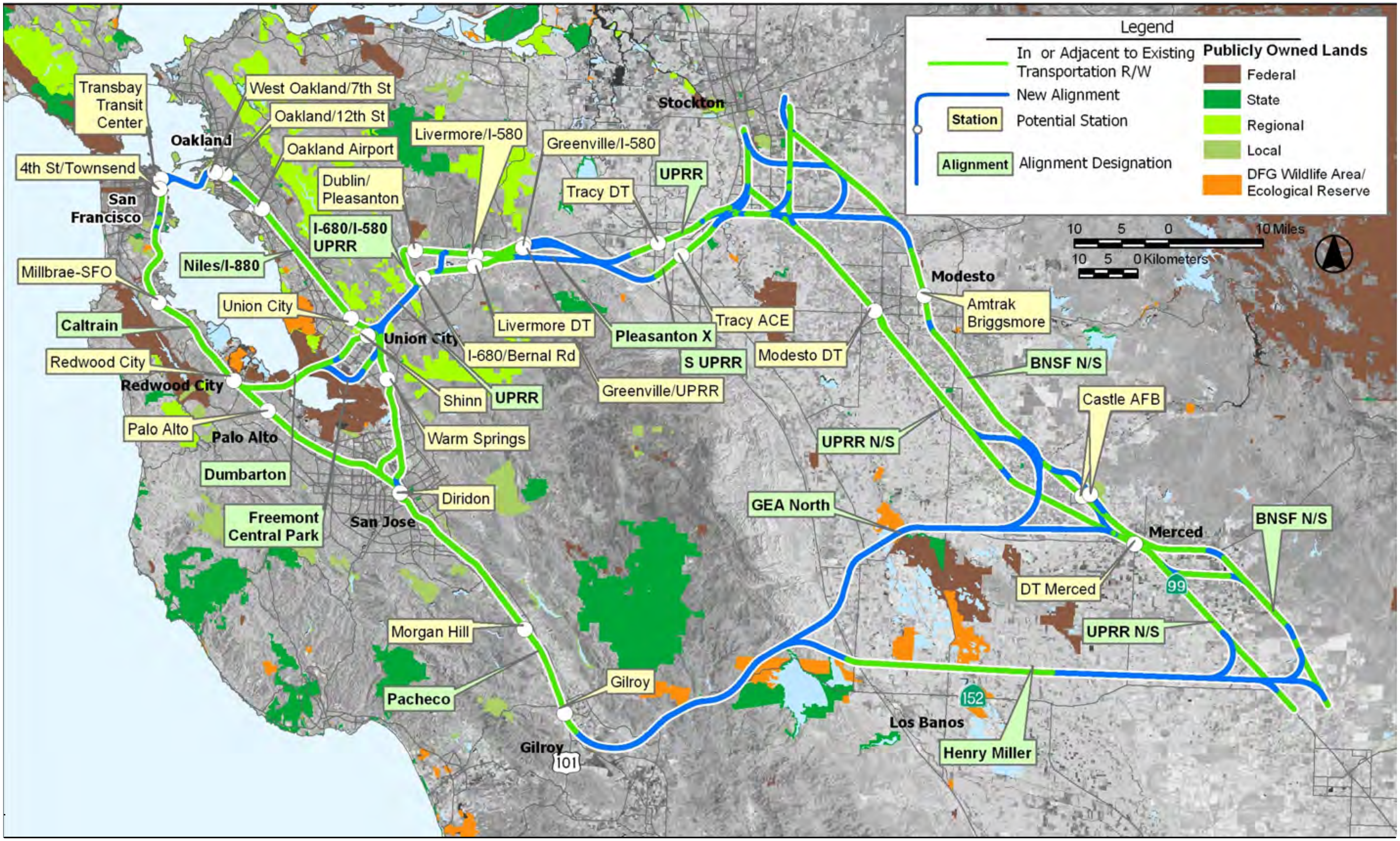


Figure 2.5-4
Relation to Existing Transportation Corridors

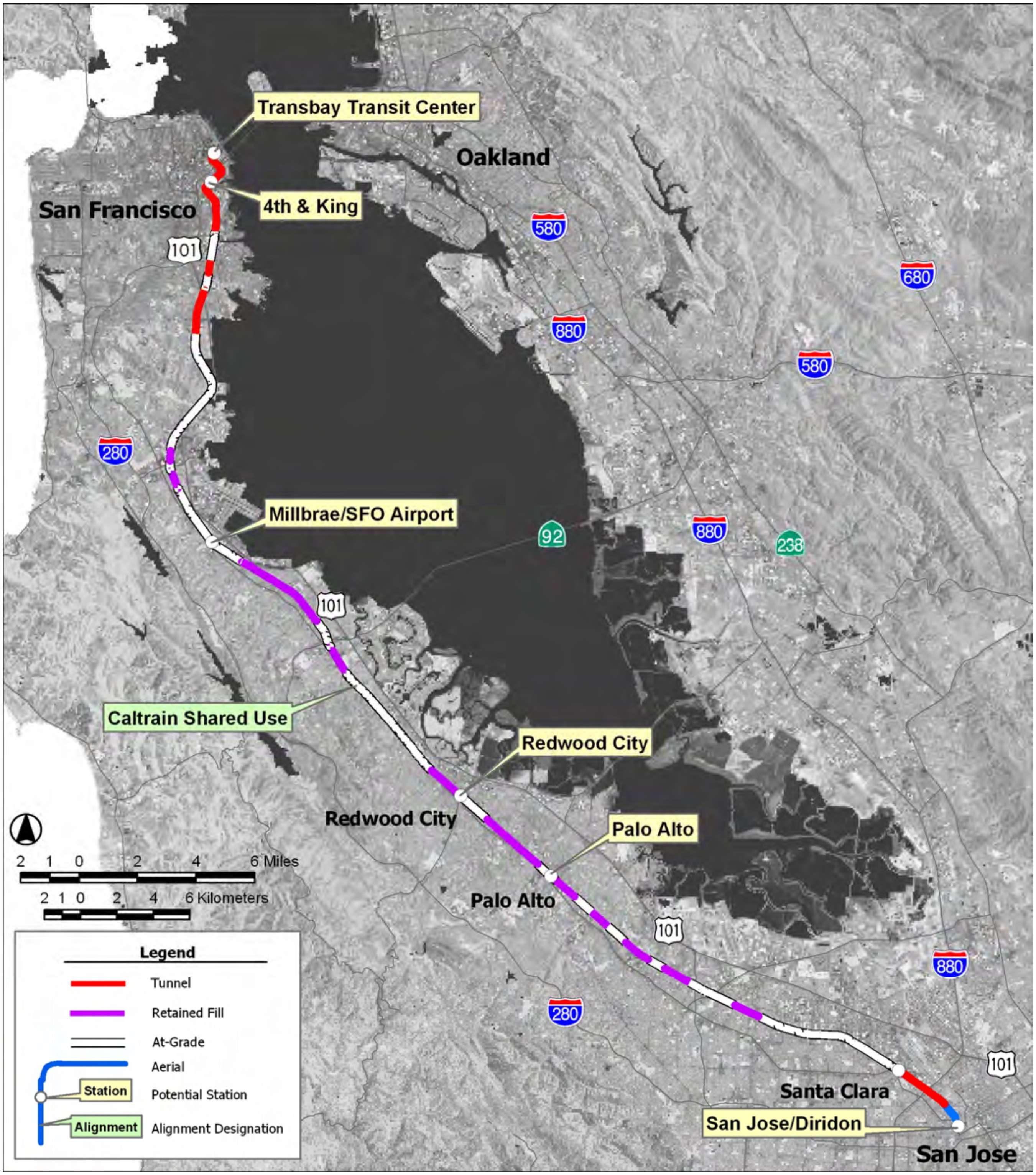


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Figure 2.5-5
San Francisco to San Jose—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

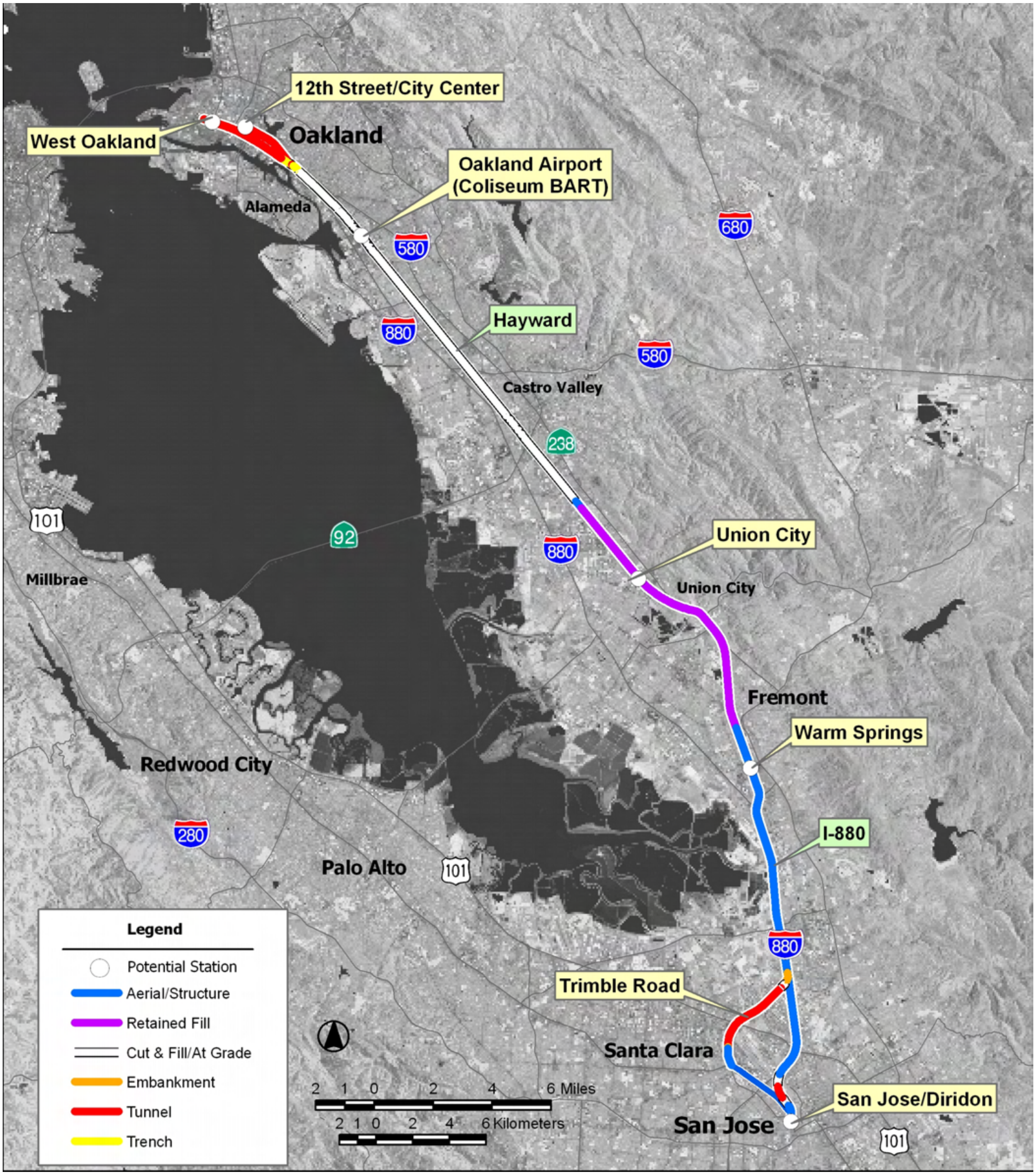

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Figure 2.5-6
Oakland to San Jose—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

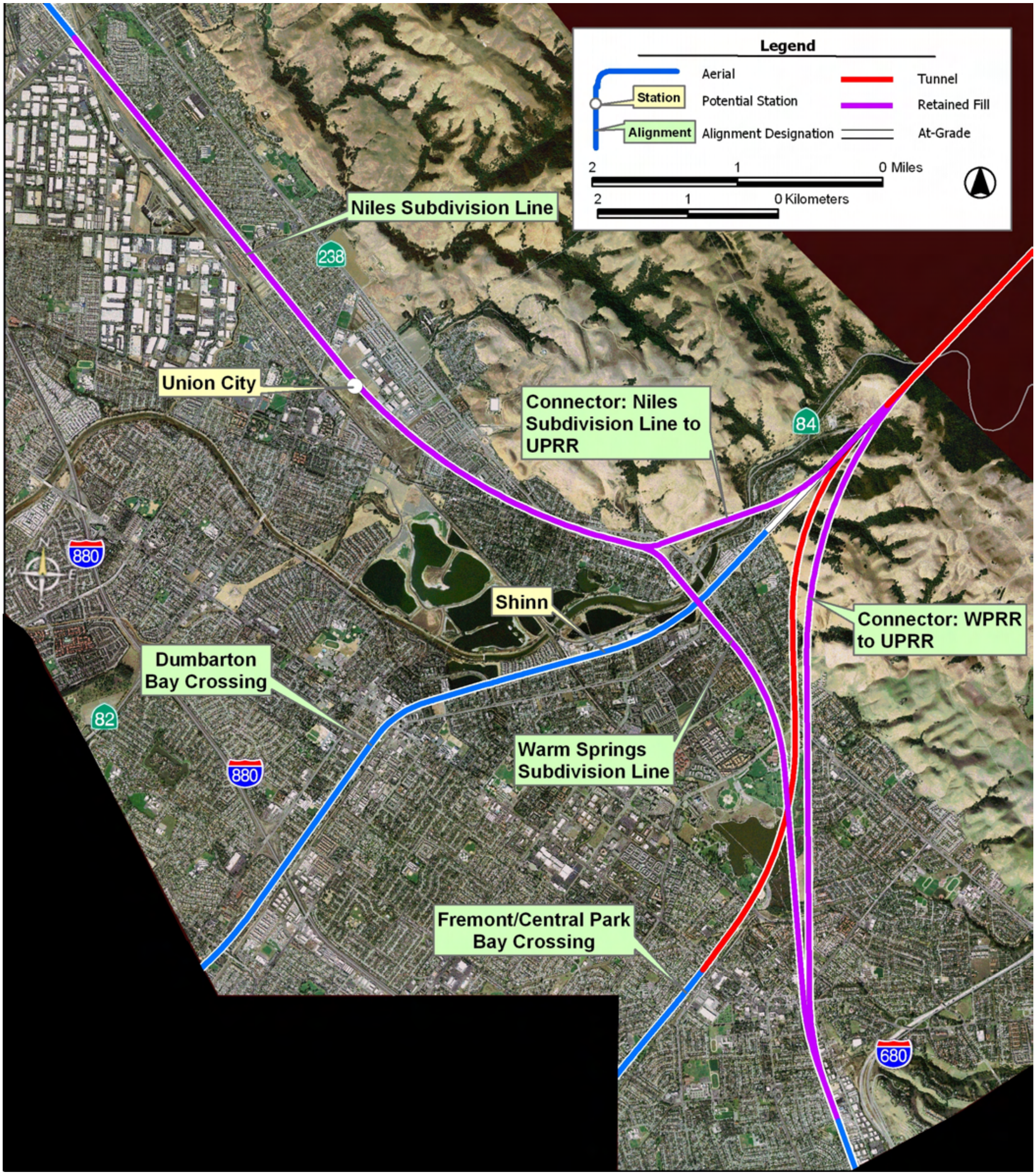

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Figure 2.5-6A
Niles Junction—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

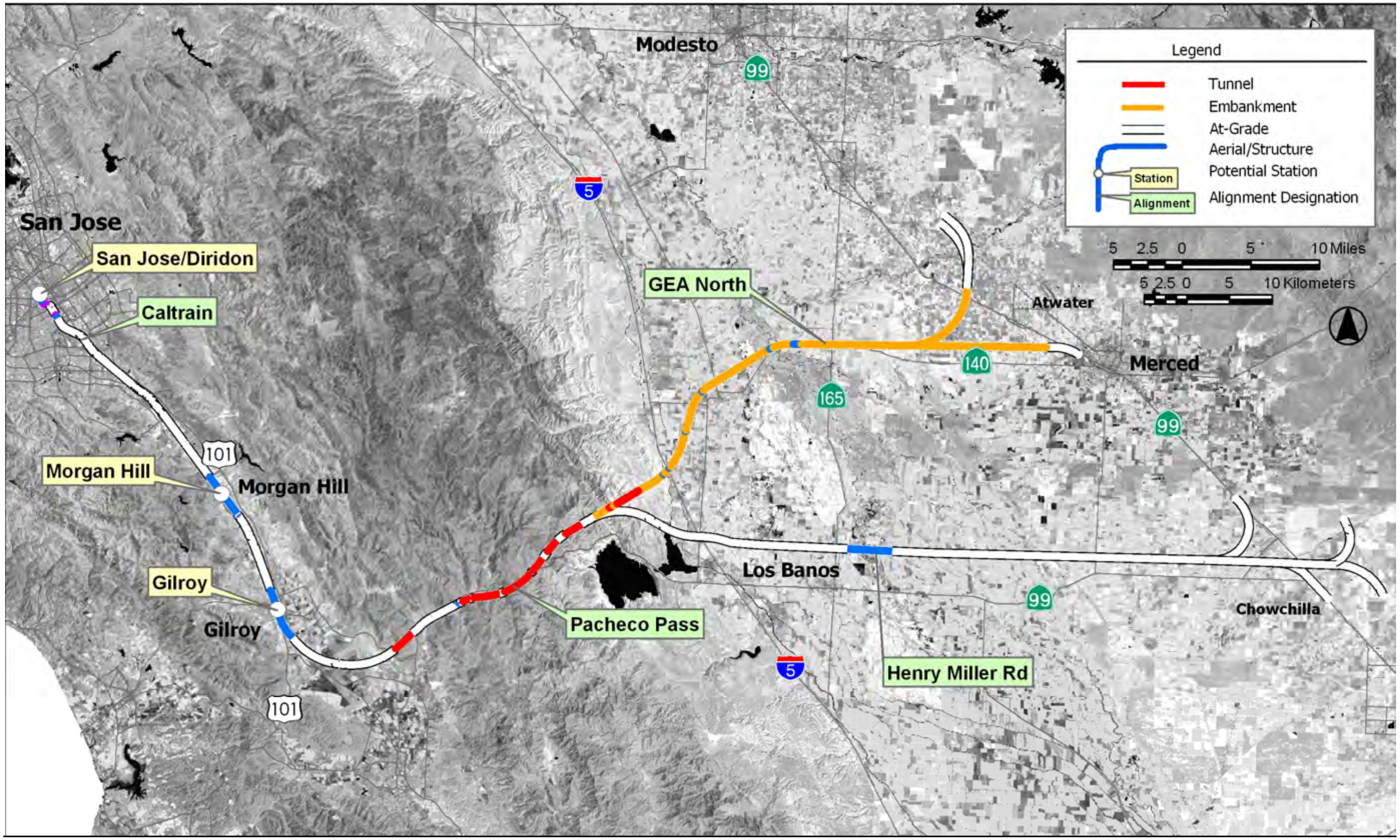

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Figure 2.5-7
San Jose to Central Valley—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

- Patterson Pass/UPRR: This alignment alternative would extend east via a relatively direct routing (mostly in tunnel) between Niles Junction and I-680 then use the UPRR alignment through Pleasanton and Livermore before transitioning to the I-580 corridor through the Patterson Pass between Livermore and Tracy. Station location options include the Pleasanton (Bernal/I-680) Station, Livermore (near downtown), and Tracy (downtown) or Tracy (ACE).

Station Location Options Carried Forward

Tri-Valley

- Pleasanton (1-680/Bernal Road): This potential station location would serve the Altamont I-580/UPRR alignment alternative and the Altamont UPRR alignment alternative.
- Pleasanton (BART): This potential station location would serve the Altamont I-580/I-680/UPRR alignment alternative.
- Livermore (Downtown): This potential station location would serve the Altamont UPRR alignment alternative.
- Livermore (I-580): This potential station location would serve the Altamont I-580/I-680/UPRR alignment alternative and the Altamont I-580/UPRR alignment alternative.
- Livermore (Greenville Road/UPRR): This potential station location would serve the Altamont UPRR alignment alternative.
- Livermore (Greenville Road/I-580): This potential station location would serve the Altamont I-580/I-680/UPRR alignment alternative and the Altamont I-580/UPRR alignment alternative.

Tracy

- Tracy (Downtown): This potential station location would serve all Altamont Pass alignment alternatives.
- Tracy (ACE): This potential station location would serve all Altamont Pass alignment alternatives.

San Francisco Bay Crossings

The alignment alternatives carried forward in this corridor for further consideration are illustrated in Figures 2.5-9 and 2.5-10 and discussed below.

Alignment Alternatives Carried Forward

- New Transbay Tube: This alignment alternative would connect the Oakland (West Oakland or 12th Street City Center) and San Francisco (Transbay Transit Center or 4th and King) HST stations via a new transbay tube. This alignment alternative could serve either Altamont Pass or Pacheco Pass alignment alternatives.
- Dumbarton Rail Crossing (Centerville): This alignment alternative would serve the Altamont Pass alignment alternatives and link the East Bay to the Peninsula in the vicinity of the existing Dumbarton Rail Bridge. Between Niles Junction and the Dumbarton Bridge, this alignment would use the Centerville rail alignment. Possible designs for this alignment include use of an improved Dumbarton Rail Bridge (low level), a new high-level bridge, and a new transbay tube.
- Dumbarton Rail Crossing (Fremont Central Park): This alignment alternative would serve the Altamont Pass alignment alternatives and link the East Bay to the Peninsula in the vicinity of the existing Dumbarton Rail Bridge. Between Niles Junction and the Dumbarton Bridge, this alignment would use an existing utility alignment and a new alignment through the Don Edwards Natural Wildlife Refuge. This alignment would require tunneling under Fremont Central Park. Possible designs for this alignment include use of an improved Dumbarton Rail Bridge (low level), a new high-level bridge, and a new transbay tube.

Station Location Options Carried Forward

Southern Alameda County

- Union City (Shinn): This potential station would serve the population centers between Oakland and San Jose only for Altamont Pass (East Bay to Central Valley) alignment alternatives using the Dumbarton Rail Crossing (Centerville) connection to the San Francisco Peninsula.

Central Valley

The alignment alternatives and station location options in this corridor carried forward for further consideration are illustrated in Figure 2.5-11 and discussed below.

Alignment Alternatives Carried Forward

- BNSF Rail Line: This alignment alternative would connect with either the Altamont or Pacheco Pass alignment alternatives. This north-south alignment would link the Bay Area to Central Valley population centers, Sacramento, and southern California. Station location options include Modesto (Briggsmore) and Merced (Downtown and Castle AFB).
- UPRR Line: This alignment alternative would connect with either the Altamont or Pacheco Pass alignment alternatives. This north-south alignment would link the Bay Area to Central Valley population centers, Sacramento, and southern California. Station location options include Modesto (Downtown) and Merced (Downtown and Castle AFB).

Station Location Options Carried Forward

Modesto

- Downtown Modesto: This potential station location would serve the Altamont Pass and Pacheco Pass alignment alternatives using the UPRR alignment alternative.
- Briggsmore (Amtrak): This potential station location would serve Altamont Pass and Pacheco Pass alignment alternatives using the BNSF alignment alternative.

Merced

- Downtown Merced: This potential station location would serve all Altamont Pass and Pacheco Pass alignment alternatives.
- Castle AFB: This potential station would serve all Altamont Pass and Pacheco Pass alignment alternatives.

2.5.2 Alignment Alternatives and Station Locations Considered and Rejected

The following HST Alignment Alternatives and station location options were considered but rejected from further consideration in the statewide program EIR/EIS for the HST system (California High-Speed Rail Authority and Federal Railroad Administration 2005) and this Program EIR/EIS process (Figure 2.5-12). The reasons for elimination of each of the alignments evaluated are categorically summarized in Table 2.5-4 and further described in Appendix 2-G.

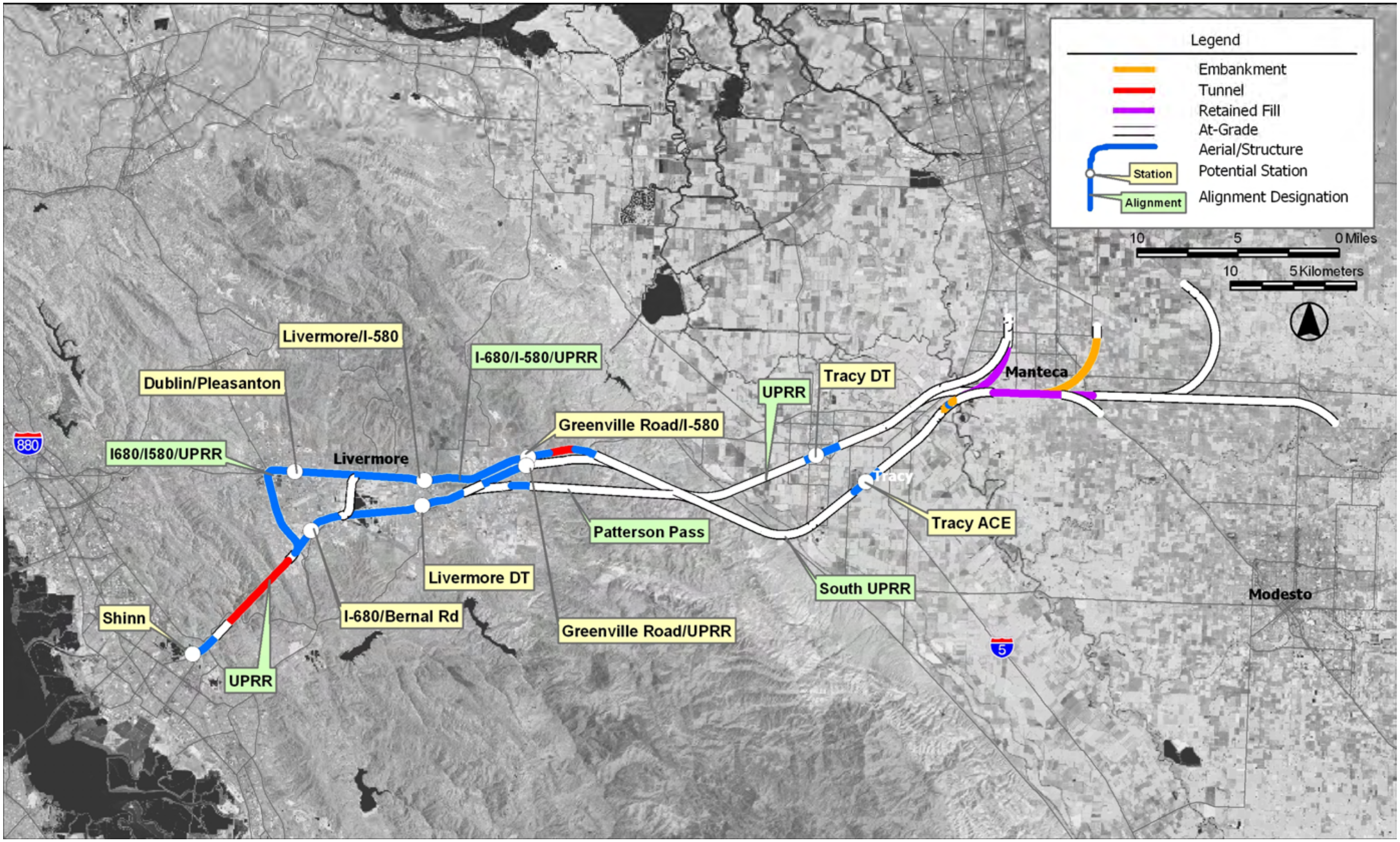

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Figure 2.5-8
East Bay to Central Valley—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

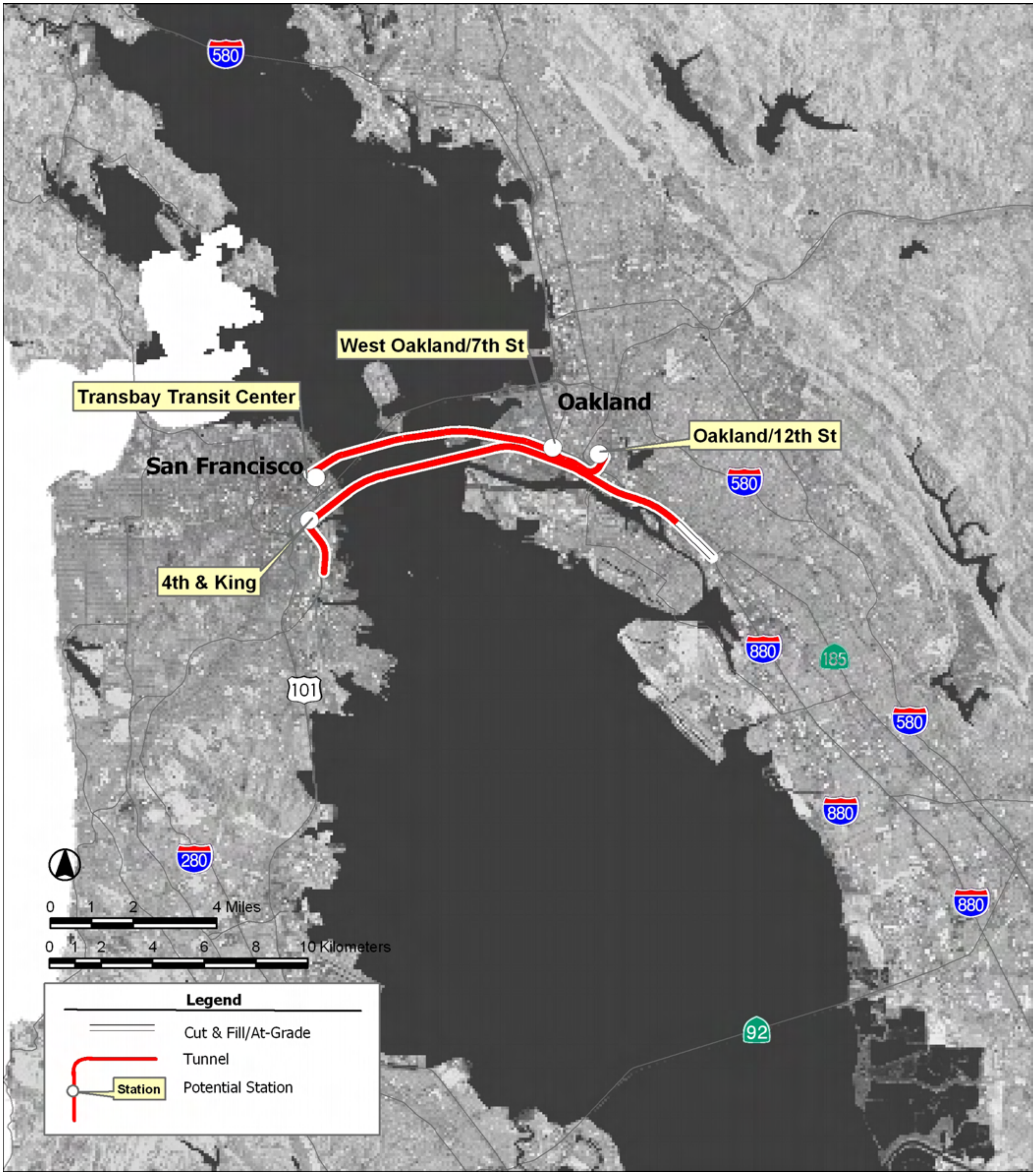

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Figure 2.5-9
San Francisco Bay Crossings (Transbay)— Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

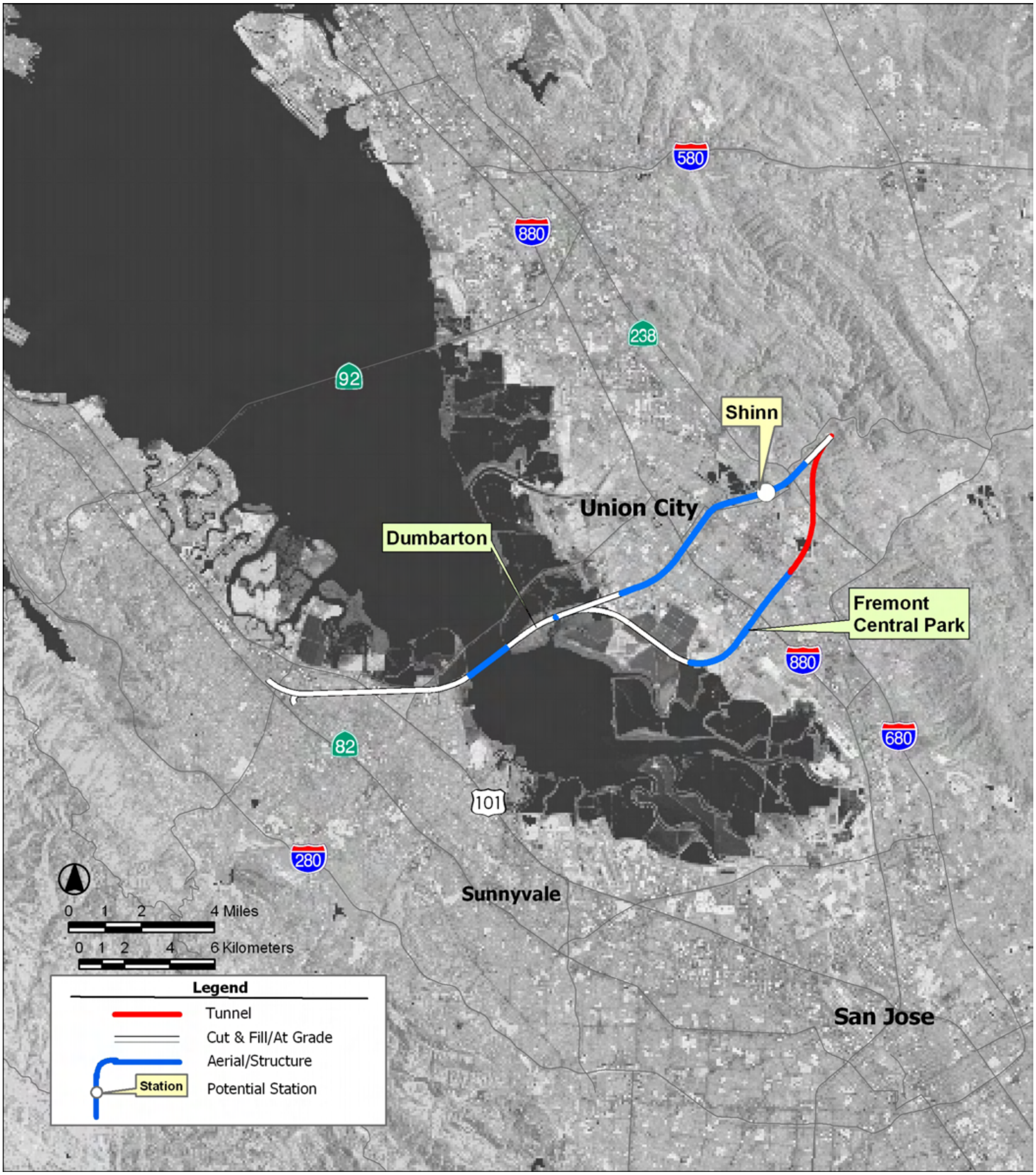

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Figure 2.5-10
San Francisco Bay Crossings (Dumbarton)—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

Table 2.5-4
Bay Area to Merced: High-Speed Train Alignment Alternatives and Station Location Options Considered and Eliminated

Alignment or Station	Reason for Elimination: Construction	Incompatibility	Right-of-Way	Connectivity / Accessibility	Revenue / Ridership	Alignment Eliminated*	Environment	Environmental Concerns
San Francisco to San Jose								
US-101 Alignment (exclusive guideway)	P	S	P				P	Visual, land use (right-of-way acquisition) impacts
Caltrain Corridor (exclusive guideway)	P	P	P				P	Visual, land use (right-of-way acquisition), cultural resources impacts
I-280 Alignment	P		P				P	Visual, land use (right-of-way acquisition) impacts
Station Locations								
Millbrae–SFO (US-101)						P		
Redwood City (US-101)						P		
Santa Clara (Caltrain)					P			Station area would be served by Diridon Station only 3 miles away
Oakland to San Jose								
Mulford Line	P	P	P				P	Visual, land use, wetlands, parklands impacts
I-880 (Note: Only Oakland to Fremont portion to be eliminated)	P		P					
Former WPRR Rail Line to Mulford Line (WPRR/Niles/Mulford alignment)	P						P	Wetlands, parklands impacts
Hayward Line via tunnel to Mulford Line (Hayward/Tunnel/Mulford alignment)	P	S	P				P	Wetlands, parklands, land use impacts; seismic constraints
Former WPRR Rail Line via tunnel to Mulford Line (WPRR/Tunnel/Mulford)	P	S	P				P	Wetlands, parklands, land use impacts; seismic constraints
Former WPRR Rail Line to Hayward Line to I-880 (WPRR/Hayward/I-880)	P							
Former WPRR (Warm Springs to San Jose)	P		P					
Tunnel under Fremont Central Park	P						S	Seismic constraints, parklands
Station Locations								
Lake Merritt		P		P				
Jack London Square	P			P				
I-880 Hegenberger						P		
Coliseum BART (WPRR)						P		
Mowry Avenue	P					P		
San Jose to Central Valley								

Alignment or Station	Reason for Elimination							
	Construction	**Incompatibility**	**Right-of-Way**	**Connectivity/ Accessibility**	**Revenue / Ridership**	**Alignment Eliminated***	**Environment**	**Environmental Concerns**
Merced Southern alignment (Central Valley Portion of San Jose-Merced section for Diablo Range Direct alignments)							P	San Luis National Wildlife Refuge impacts
Direct Tunnel Alignment (Northern or Southern Connection to Merced	P						S	Seismic constraints
Diablo Range Direct Alignments (Northern Alignment and alignments through Henry Coe State Park)	P						P	Parklands, habitat fragmentation, high value aquatic resources, visual, noise impacts
Caltrain/Morgan Hill/Foothill/Pacheco Pass Alignment	P	P		P			P	Visual, land use impacts
Caltrain/Morgan Hill/East US-101/Pacheco Pass Alignment		P		P				
Caltrain/Morgan Hill/Pacheco Pass Alignment	P		P					
Station Locations								
Morgan Hill (Foothills)				P		P		
Morgan Hill (east of US-101)				P		P		
Los Banos					P		P	Water resources, threatened and endangered species, growth related impacts
East Bay to Central Valley								
SR-84/South of Livermore		S		S			P	Natural resources, habitat and endangered species, agricultural lands, water resources impacts
SR-84/I-580/UPRR		S		S			P	Natural resources, habitat and endangered species, agricultural lands, water resources impacts
I-580: Bay Fair to Pleasanton	P		S					Construction, logistical constraints, right-of-way
Station Locations								
Pleasanton (I-680/SR-84)				S		P		
Livermore (Greenville Rd/SR-84/UPRR)				S		P		
Livermore (Isabel/SR-84)				S		P		
Central Valley Alignments								
West of SR-99				P			P	Farmlands, water resources, floodplains, severance impacts
East of SR-99				P			P	Farmlands, water resources, floodplains, severance impacts

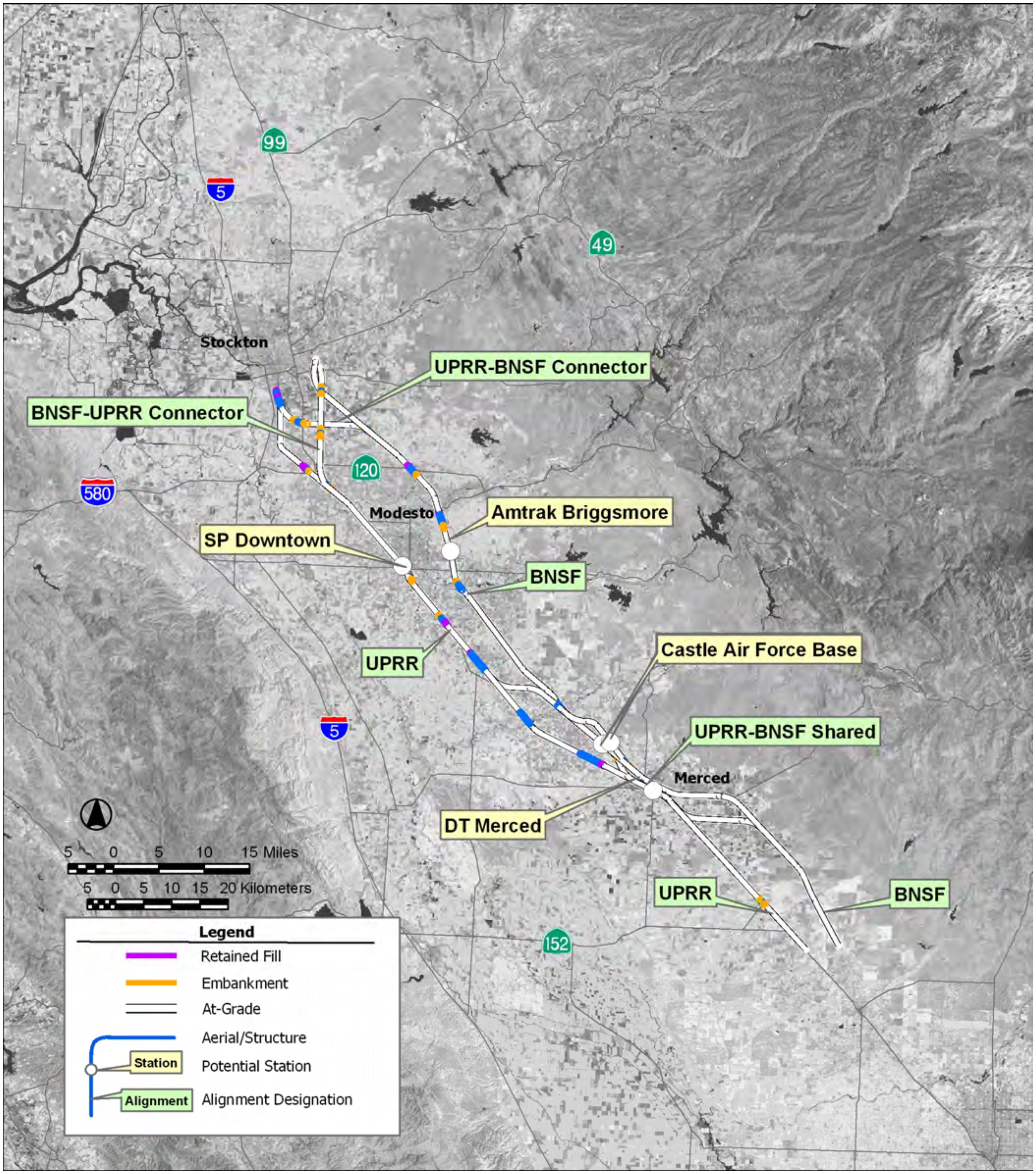

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Figure 2.5-11
Central Valley Alignment—Alignment Alternatives and Station Location Options Carried Forward for Further Consideration

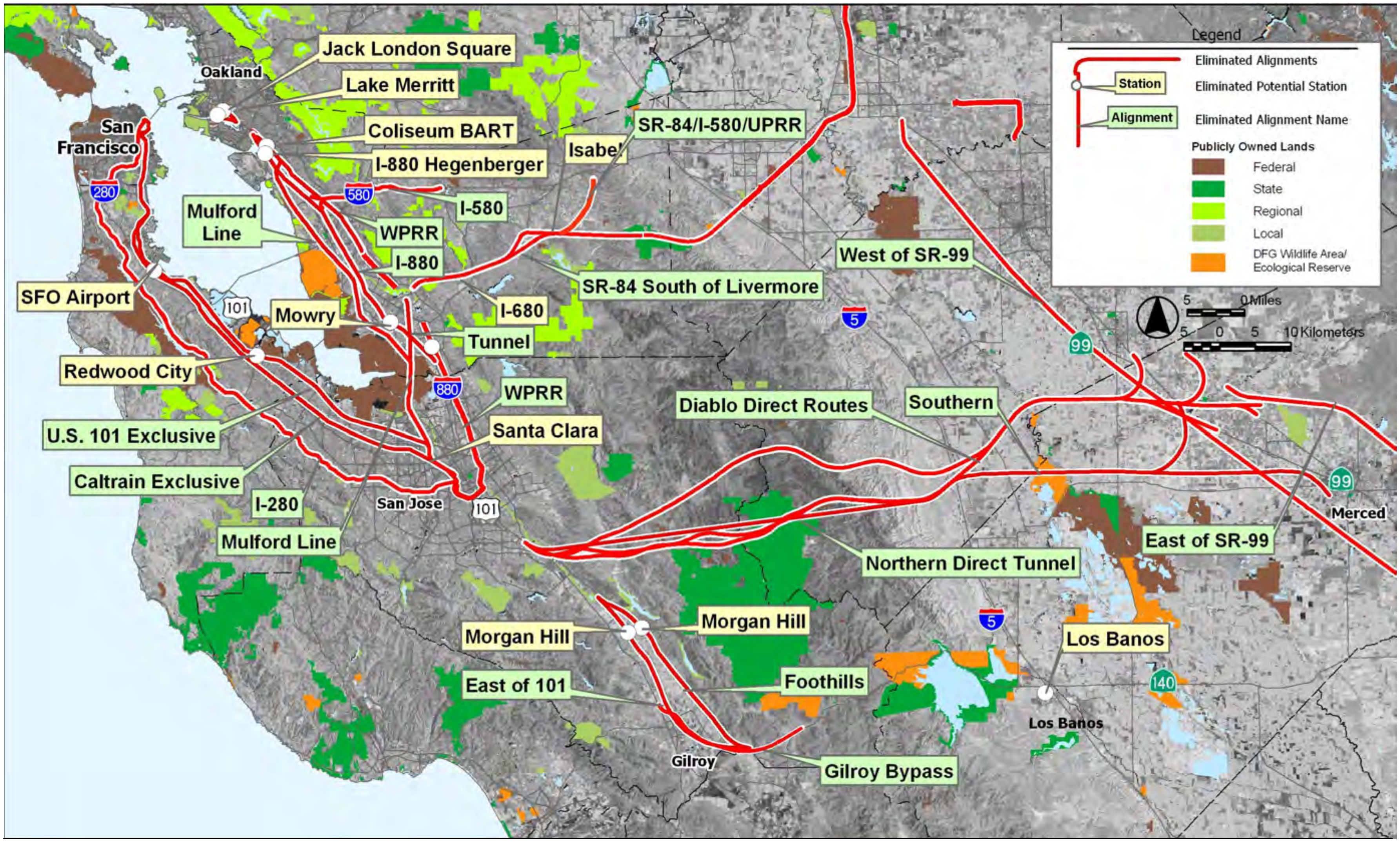

Figure 2.5-12
Alignment Alternatives and Station Location Options Considered but Eliminated from Further Consideration

Alignment or Station	Reason for Elimination							Environmental Concerns
	Construction	Incompatibility	Right-of-Way	Connectivity/ Accessibility	Revenue / Ridership	Alignment Eliminated*	Environment	
Definitions:								

Reason: Primary (P) and secondary (S) reasons for elimination.

Construction: Engineering and construction complexity and initial and/or recurring costs would render the project impracticable and logistical constraints.

Environment: High potential for considerable impacts to natural resources, including water resources, streams, floodplains, wetlands, and habitat of threatened or endangered species, would fail to meet project objectives.

Incompatibility: Incompatibility with current or planned local land use as defined in local plans would fail to meet project objectives.

Right-of-Way: Lack of available rights-of-way or extensive right-of-way needs would result in high acquisition costs and/or delays that would render the project impracticable.

Connectivity/Accessibility: Limited connectivity with other transportation modes (aviation, highway, and/or transit systems) would impair the service quality, could reduce ridership of the HST system, and would fail to meet the project purpose.

Ridership/Revenue: The alignment/station would result in longer trip times and/or have suboptimal operating characteristics and would have low ridership and revenue and would fail to meet the project purpose.

Alignment Eliminated: Station or connection eliminated because the connecting alignment was eliminated.

* Alignment Eliminated column applies only to station locations. If an alignment is eliminated, a specific station location may no longer be necessary.

2.5.3 Maintenance and Storage Facilities

Representative maintenance and storage facilities that would be necessary to support the HST fleet have been considered in this Program EIR/EIS. A rail system simulation model was used to develop an overall operating and maintenance concept, based on an HST system with termini in both San Francisco and Oakland, that would be responsive to the forecast representative demand and that could deliver the levels of HST service desired. Only general track locations and infrastructure configurations were developed for these facilities for this Program EIR/EIS. Other possible sites would be considered when detailed system requirements, land use, and site information are available at the project level. The specific facilities considered in this Program EIR/EIS are listed below and illustrated in Figure 2.5-13.

- West Oakland: One site for a fleet storage/service and inspection/light maintenance facility could be located two blocks northwest of where Peralta Street intersects Mandela Parkway and southeast of where the alignment is parallel to I-880.
- Merced: One site for a fleet storage/service and inspection/light maintenance facility could be located near Castle AFB.

Because of the constraints of existing urban development around some of the terminus station locations, it is assumed that only minimal storage and very basic service, inspection, and light maintenance functions would be integrated into the station infrastructure. The majority of the fleet storage and service, inspection, maintenance, and repair requirements are assumed to be supported at two types of independent facilities that were defined and generally sited.

A. FLEET STORAGE/SERVICE AND INSPECTION/LIGHT MAINTENANCE

Fleet Storage/Service and Inspection/Light Maintenance Facility

The desirable configuration for this facility would include tracks for "lay-up" (parking) for trainsets, a service and inspection (S&I) facility for inspection and light maintenance, and a train washer located on the yard approach track for exterior cleaning prior to daily train storage. In addition, adjacent to the S&I facility, on a separate track, would be a wheel truing facility capable of accommodating two cars at a time. There would also be provision for an employee administrative and comfort area.

Main Repair and Heavy Maintenance Facility

The conceptual configuration for this heavy maintenance complex includes a wheel-truing area, an S&I area, a running repair facility, support shops, material inventory and distribution area, component change-out area, overhaul shop, heavy repair facility, and exterior maintenance shop. The following descriptions are examples of the types of areas, shops, and functions that have been considered for the conceptual configuration of the main repair and maintenance facility.

Wheel-Truing Area

The wheel-truing area is configured to accommodate two cars. It is used to return wheel diameter parity and profile due to the stresses of track wear, drift, spalling, and wheel flat spots. The wheel truing machine is mounted under the floor for ease of operation. Rail cars are pulled over the machine to expedite turnaround time. Candidate vehicles for wheel truing are typically identified during a programmed maintenance inspection.

Service and Inspection Area

The service and inspection area is configured as a two track "run-through" facility. Tracks are equipped with observation pits and door level platforms for ease of inspection and light repair, providing access to under car, interior floor, and roof levels. Located between this area and the main maintenance area is a "runaround" track that would allow direct access/egress to both sides of the shop.

The Running Repair Area

The running repair area is configured with raised rail mounted on post structures and observation pits with depressed side floors. The posted, raised rail provides access to under car components requiring repair or replacement. Side floor and roof height platforms are also assumed in this configuration. The observation pit is equipped with a lift device to facilitate the removal and replacement of larger, heavier component units. Platforms provided at the car body side height provide access to glass, door, and interior and exterior repair requirements. A platform at the roof level provides access to the pantograph, resistor grids, and a/c components for servicing activities as required.

Support Shops

Based on the needs of specific fleet design parameters examples of shop areas and functions include the following:

- Truck Shop: equipped with a storage track and turntables for the efficient transition of trucks requiring service and trucks ready for installation. Direct access is provided to the Component Cleaning Area, (located on an exterior wall) to prepare the trucks for overhaul/heavy repair. This area includes truck hoists to facilitate efficient repair, disassembly, and reassembly. Additional turntables and connecting tracks would be provided in this area to provide for the required maneuverability of truck assemblies.

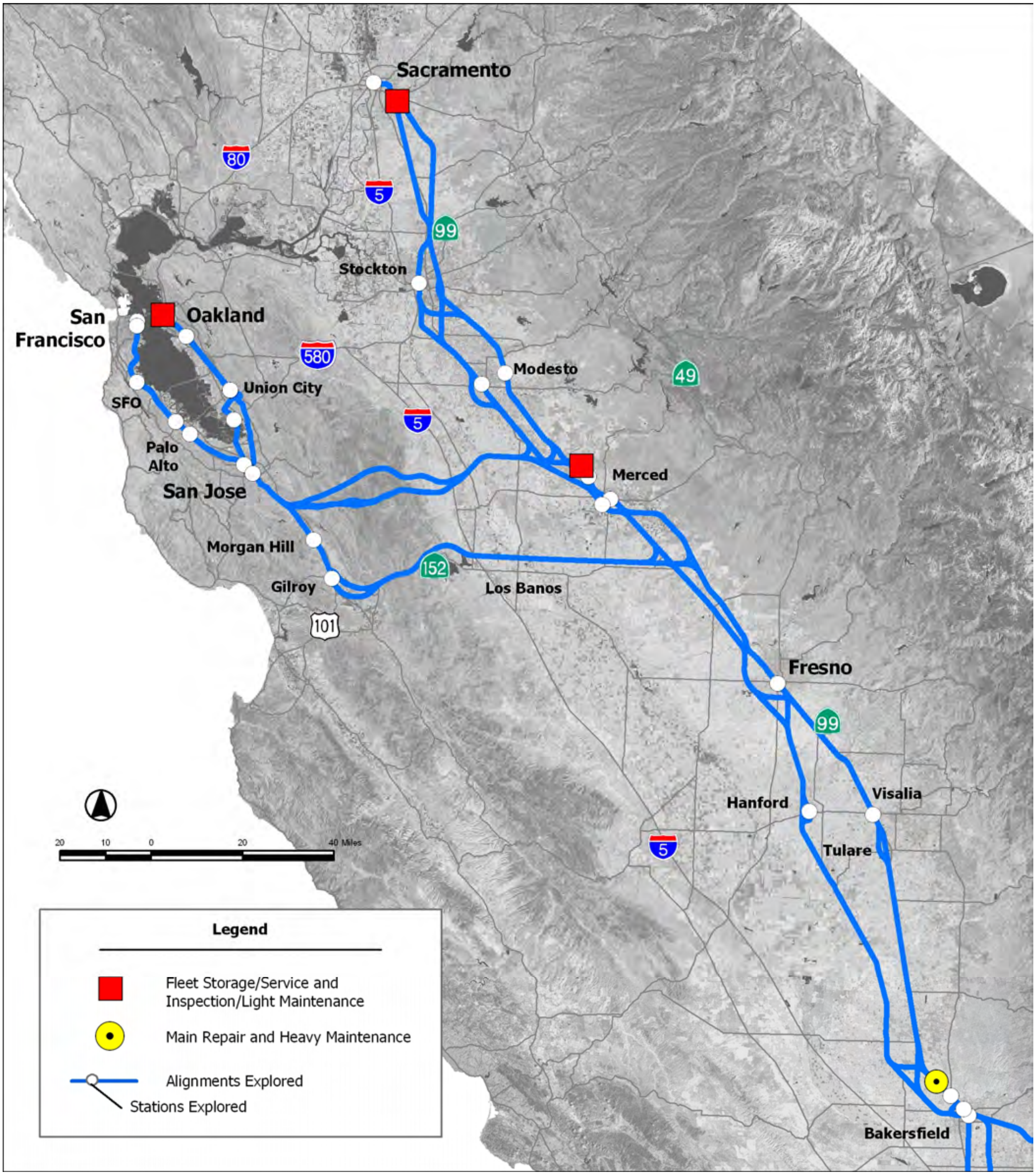

Figure 2.5-13
Support Facilities Considered (North)

- Component Cleaning Area: This enclosed work area, located on an exterior wall, would be used to pre-clean large components such as rail vehicle trucks, air compressors, and air conditioning units (condensers and evaporators) prior to disassembly and repair or shipment.
- Brake Shop: This area would be used to clean, disassemble, repair, reassemble, and test brake units and all brake actuators.
- Air Room: This facility would be used to clean, inspect, troubleshoot, repair, rebuild, paint, and test all types of brake valves and brake system components. The work area would be divided into four separate sections: the valve cleaning room, the repair area, the valve painting area, and the valve test area. The repair and test operations are performed in enclosed, temperature-controlled rooms. Repair operations are performed in individual workstations.
- Clean Room/Electronics Shop: This enclosed, temperature controlled room would be equipped to clean, troubleshoot, repair, and test trainset electronic components such as panels, relays, inverters, battery chargers, circuit cards, and selected control units. Repair activities are generally performed at individual workstations using specialized electronic test equipment.
- HVAC Unit Repair Shop: This area would be used to repair the components associated with air conditioning units.
- Pantograph Repair Area: This area would be located on a suspended platform at the roof level of a rail car for the removal and installation of electric propulsion energy collection components.
- Battery Room: This area supports the disassembly, cleaning, testing, and reassembly of multi-cell battery units.
- Wheel Shop: This area supports the fabrication and repair of wheel and axle sets. Machine technology resident in this shop includes a mounting press, demount press, wheel bore, and axle lathes.

Material Inventory and Distribution Area

This area serves as the distribution point in the Main Maintenance and Repair Facility for the material required to maintain, repair, clean, service, and provide for the state of good repair of the high-speed rail fleet. The area includes a loading dock for highway vehicles, space for the storage of transitional components (wheel sets, air compressors, etc.), and equipment (cranes, forklifts, pallet shelving etc.) associated with the efficient storage and distribution of rail car components and equipment.

Component Change-Out Area

This area is configured as a four track “run-through” facility. The hoist section of this area has the capacity to lift eight coupled rail cars on two separate tracks. Located between these tracks are two tracks configured for the removal and installation of rail car trucks. Car body posts hold the rail vehicle in place while the trucks are removed and positioned on one of the four available truck turntables for efficient transition into the Truck Shop.

Overhaul Area

This area is utilized in the life cycle maintenance program. Rail cars undergo rebuild and major component replacement on either a time or mileage based cycle. Systems and subsystems are removed, rebuilt, and replaced.

Heavy Repairs

This area accommodates repairs to a rail car that requires it to be out of service for an extended length of time.

Exterior Maintenance Shop

This area provides for the cosmetic and minor body damage repair, touch-up, and periodic re-painting of vehicle exteriors.

One fleet storage/service and inspection/light maintenance facility would be needed for each major branch of the statewide HST system (i.e., Bay Area, Sacramento, and southern California). These facilities would need to be sited as near as possible to the terminal stations. Main repair and heavy maintenance facilities are generally located near the main trunk line of the system (Los Angeles to Merced), where the majority of trains would pass on a daily basis. Only one main repair and heavy maintenance facility would be necessary.